Railway Maintenance Engineer

me 13 | CHICAGO: Transportation Building NEW YORK: Woolworth Building | MAY, 1917 | CLEVELAND: Citizens' Building WASHINGTON: Home Life Building | Number 5

A Modern Instance of Profitable Portability

FOR three months the M. of W. Dept. of a certain railroad needed some odd sizes of ties. They had been ordered, but they simply could not get delivery.

The need for those ties grew stronger daily, as did the prodding of the Storekeeper by the Engineering Department. The latter got hot, the former crazy, but the M. of W. Dept. did not get the ties.

Something had to be done—something was done. White oak piles were taken from stock, fed to a portable saw mill which ripped them up into railroad ties of the length desired, and peace reigned again.

This is no publicity yarn. It was the *New York Central Railroad* that needed those ties, it was an *American Portable Saw Mill* that made the M. of W. Dept. happy, and it was April 13, 1917, when the shipment was made.

There is a moral to this tale—a good part of the timber used by your road could be used over again, if some easy and economical means were at hand for resawing it into usable form.

Old piles, pile butts, caps, stringers, turned into usable lumber, rush orders for odd sizes filled promptly. No wonder the Enginering Department of the N. Y. C. R. R. Co. states that the

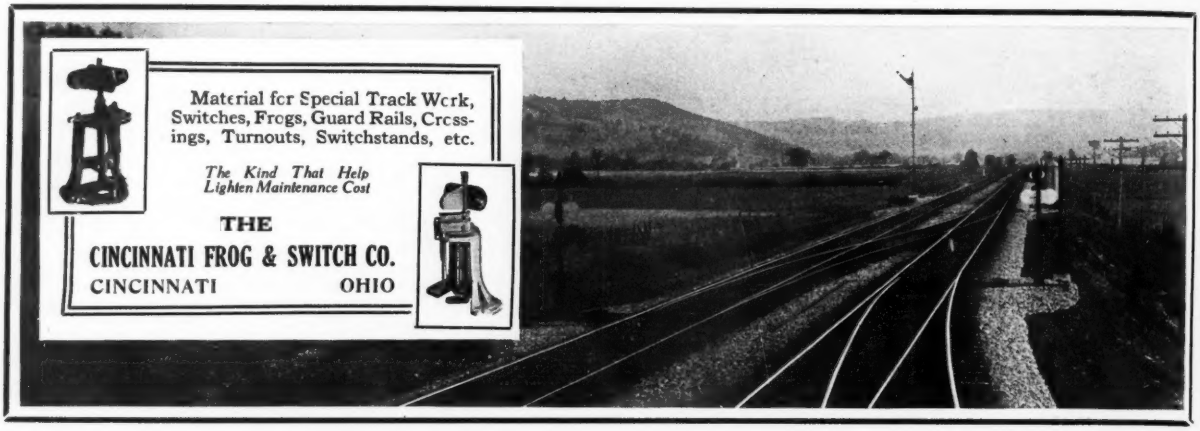
AMERICAN PORTABLE SAW MILL

Is Almost Indispensable and Saves a Large Amount of Money

Preparedness for American Railroads Means an American Portable Saw Mill. Send for catalogue and you'll see why.

American Saw Mill Machinery Co.

1366 Hudson Terminal Building
New York, N. Y.


Material for Special Track Work, Switches, Frogs, Guard Rails, Crossings, Turnouts, Switchstands, etc.
The Kind That Help Lighten Maintenance Cost
THE
CINCINNATI FROG & SWITCH CO.
CINCINNATI OHIO

FROGS — SWITCHES — STANDS

Manganese and Built-Up Construction

IN STOCK for IMMEDIATE SHIPMENT

THE INDIANAPOLIS SWITCH & FROG COMPANY

NEW YORK SPRINGFIELD, OHIO CHICAGO

ESTABLISHED 1882

THE WEIR FROG CO.

Track Work of Rail and Manganese Steel Construction

CINCINNATI --- --- --- --- --- OHIO

THE P. & M. — RAIL ANTI-CREEPERS — THE VAUGHAN

FOR HEAVY SERVICE DOUBLE TRACK.
THE GREATER THE CREEPING TENDENCY, THE GREATER IT GRIPS THE RAIL AND HOLDS.

FOR SINGLE TRACK.
THE ACTION OF A POWERFUL TORSION SPRING KEEPS IT EFFECTIVE UNDER ALL CONDITIONS OF CREEPING.

SOLD BY

THE P. & M. CO.

SAN FRANCISCO
ST. PAUL

RAILWAY EXCHANGE
CHICAGO

NEW YORK
DENVER

"Yes—They're the Valves I Want"

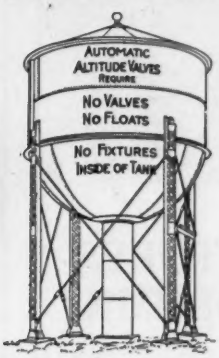
for many a vexatious problem in fire, sprinkler and other water distribution systems and a positive cure for all needless water waste down the overflow of Tanks, Standpipes and Reservoirs.

Golden-Anderson Patent Automatic Cushioned Water-Regulating Valves up to 24 in.

A POSITIVE WATER SUPPLY

ABSOLUTELY ASSURED BY

Golden-Anderson Automatic Cushioned Controlling Altitude Valves



For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. "Three Ways of Closing These Valves."

1st—Automatically by Water.
2nd—By Electricity. if desired.
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.

Valves Cushioned at all times by air and water
No water hammer or bursting mains
"NO METAL-TO-METAL SEATS"

"Hosts" of "References"

Golden-Anderson Valve Specialty Co.

1200 Fulton Bldg. **Water and Steam Specialties.** **PITTSBURGH, PENNA.**

For Pumping Out Trenches and Excavations

Goulds Fig. 1687 Diaphragm Force Pump

This pump has a decided advantage over the ordinary diaphragm pump in that being a force pump it can be placed in the trench or excavation and the water forced to the top. It is good for a force of 15 feet, has a large capacity and is compactly built. The diaphragm is 12¾ inches in diameter and is made of the best quality rubber. The valves are metal, rubber faced and are easily removable. The waterways are large and permit an easy flow of the water. The pump is fitted with an air chamber to insure a steady flow. The discharge elbow is designed so that it can be bolted on with the discharge pointing in any one of four different directions.

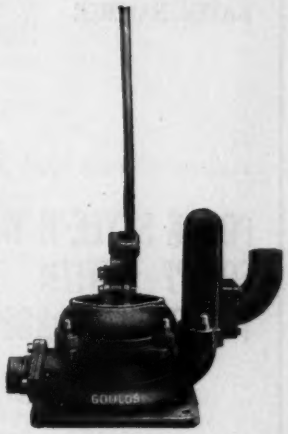


Fig. 1687
With lever for hand operation.

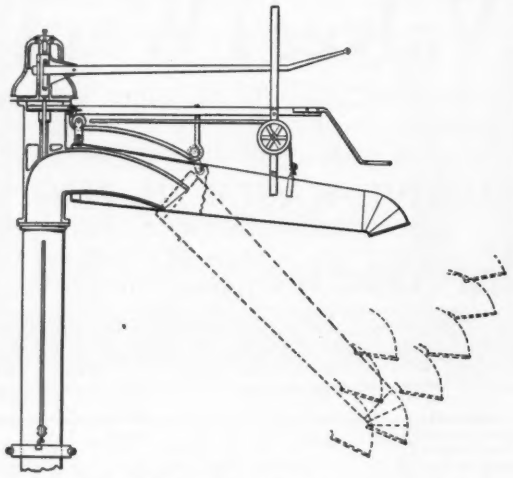
Fig. 1687 mounted on frame and connected to Fig. 1589 Jack. Frame not furnished unless specially ordered.

Furnished either with long wrought iron lever for hand operation or with short arm for connection to our Fig. 1589 Jack for belt drive from gasoline engine.

Prices on Request.

THE GOULDS MANUFACTURING COMPANY

Branch Houses: Boston, New York, Philadelphia, Chicago
Main Office and Works: Seneca Falls, N. Y.
District Offices: Pittsburgh, Atlanta, Baltimore, Houston



DO YOU LOOK FOR THESE FEATURES IN A WATER COLUMN?

DROP SPOUT POSITIVELY NON-FREEZABLE

Non-freezable telescopic joint over the discharge nozzle of the tee—a joint that is entirely open, without packing or working apart, yet does not waste a bit of water.

WITH ABSOLUTE FLEXIBILITY

The greatest possible flexibility—a vertical adjustment range of five feet and a lateral adjustment range of three feet.

QUICK CLOSURE WITHOUT WATER HAMMER

A valve mechanism so constructed as to positively eliminate water hammer even when the column is connected to a high-pressure main. The University of Illinois comparative tests showed that the Poage Style H Valve offered the least frictional resistance to flow and that the valve closure is correct (University of Illinois Bulletin No. 48).

These features are found only in the

POAGE STYLE H WATER COLUMN EQUIPPED WITH THE FENNER DROP SPOUT

Actual everyday usage has proven that the Poage construction principles are correct. Give the Poage Style H Water Column a rigid tryout—see for yourself how maintenance costs are cut and time is saved. Write for illustrated booklet *now*.

The Poage Water Column and The Fenner Drop Spout are manufactured exclusively by

THE AMERICAN VALVE & METER CO.
CINCINNATI, U.S.A.

Service and Use

determine the value of protective paints.

Dixon's Silica-Graphite Paint

has been in use by railroads, industrial concerns and general users

Over Fifty Years

Metal work properly painted has not required repainting in from five to fifteen years. It is therefore known the world over as

The Long Service Paint

considering cost of labor in frequent repainting and dividing cost by years of service, the economy of Dixon's Silica-Graphite Paint is readily seen.

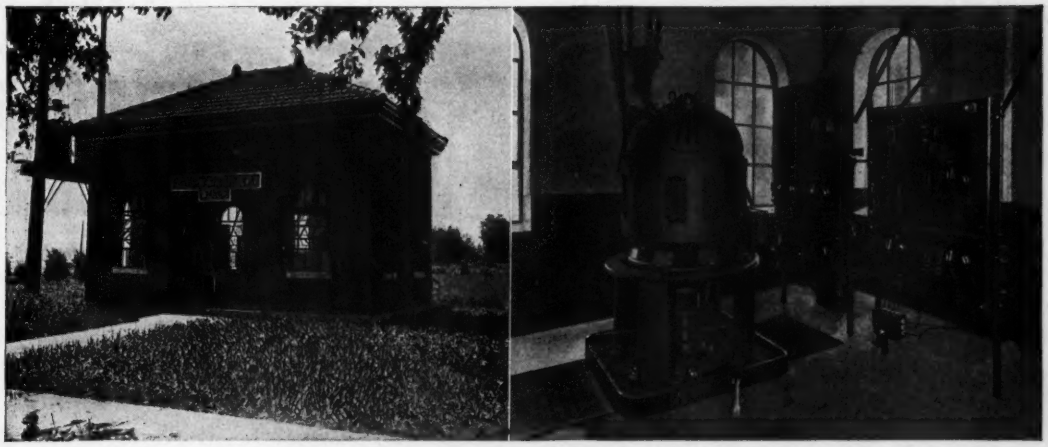
Address Department 187 B.

Made in Jersey City, N. J., by the

Joseph Dixon Crucible Company

Established 1827

AMERICAN



Pumping from Greatest Depth in a Municipal Unit Well Installation

In the new unit well water supply system for the City of Aurora, Illinois, what is known as the Talma Street Pump is of special interest because it is pumping from the greatest depth below the surface of any pump of this type installed for municipal service.

The well is 2200 feet deep, the first 300 feet of which is cased with 18-in. O.D. casing, below which the well is entirely in rock and is 15 in. in diameter.

During the time this well was being drilled the City of Aurora gave The American Well Works an order for a combination deep well turbine with booster centrifugal, mounted on the same shaft at the surface, to be installed in this well, the pump being designed to deliver 1000 g.p.m. from a depth of 100 feet below the surface and pumping against 65 lb. pressure at the surface.

At this point the well had a much smaller delivery than anticipated and to obtain more water the pump was lowered another 100 feet. From this depth the water supply was still less than the requirement and an order was given The American Well Works for another pump designed to pump from a much greater depth.

This pump is shown in the above illustration and is an "American" 17-in. type KT2NT7MB combination deep well turbine and booster centrifugal fitted with thirty-eight 8-ft. lengths of 10-in. supporting pipe and 40 ft. of 9-in. suction pipe, which places the opening in the suction pipe about 360 ft. below the surface. In this pump the shaft is 2-in. nickel steel and all impellers and diffuser vanes are made of bronze.

The pump was designed to discharge 550 gallons of water a minute against a total head of 497 feet when running at 1150 r.p.m., and an overall efficiency of 58% was guaranteed.

The official test of this pump after the installation was completed, made in accordance with rules laid down by the city's consulting engineer, Mr. Dabney H. Maury of Chicago, shows that the pump delivers 650 gallons of water a minute against a total head of 497 ft., with an overall efficiency of 61%, and 800 gallons of water a minute, against a total head of 416 ft., with an overall efficiency of 56%.

After the official test the Mayor desired another test run of the pump when discharging directly into the mains. The result of this test shows that the pump discharges 630 g.p.m. against a total head of 497 ft., when running at a speed of 1172 r.p.m., with an overall efficiency of 61%, and 760 g.p.m. against a total head of 446 ft., when running at a speed of 1167 r.p.m., with an overall efficiency of 59½%. The performance curve shows the pump had a range of from 450 g.p.m. at 558 ft. total head to 750 g.p.m. at 446 ft. total head, with an overall efficiency of not less than 59%, which is 1% above the guarantee.

Where the well is straight and plumb this type of pump is unequalled for large capacity deep well pumping.

Catalog 132 describes these pumps. Write for it.

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First National Bank Bldg.

Sales Agencies

New York City	St. Paul, Minn.	Kansas City, Mo.	Denver, Colo.	Los Angeles	Calgary, Alta.
Philadelphia, Pa.	St. Louis, Mo.	Joplin, Mo.	San Francisco	Artesia, N. M.	Chatham, Ont.
Pittsburgh, Pa.	Dallas, Texas	Lincoln, Neb.	Salt Lake City	Edmonton, Alta.	Montreal, Que.

Capacity 50,000 Gals. Height 20 Ft. to Bottom
Chicago & Northwestern Ry.

STEEL TANKS
For
RAILWAY SERVICE

Build For The Future

The Corporations which show the most enviable dividend record over a period of years are those which have followed this policy.

A Steel Tank Is An Asset That Does Credit To Your Judgment

Chicago Bridge & Iron Works

SALES OFFICES
Chicago, Ill. Charlotte, N. C.
New York, N. Y Salt Lake City, Utah
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Jacksonville, Fla. Los Angeles, Cal.
Detroit, Mich. San Francisco, Cal.
Havana, Cuba Bridgeburg, Ont.

SHOPS
Eastern: Greenville, Pa.
Pittsburgh Dist.
Central: Chicago, Ill.
Canadian: Bridgeburg, Ont.

CABLE ADDRESS
"Chibridge Chicago"

CHALLENGE TANKS

For Railroad Work

FIR OR CYPRESS FOR DURABILITY

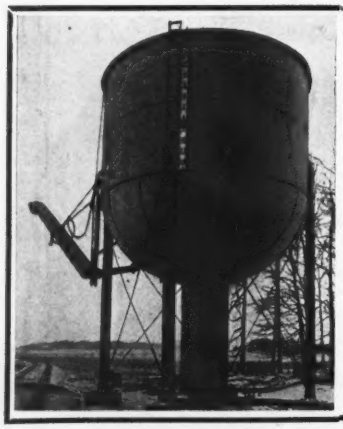
This is the Challenge way of making tanks—
Thoroughly seasoned, clear Oregon fir or Louisiana Red Gulf cypress—men specially trained in tank building—modern tank-making machinery. We build tanks large or small, standard or special.
Challenge tanks have proved to give the lowest final cost per thousand gallons because they require the least attention.
Substructures can be furnished in any height required, designed with four or twelve posts to meet the approval of the most exacting engineers. They are easily erected under your own supervision

Hoops for repairing tanks a specialty.

FLAT ROUND HALF OVAL OR HALF ROUND HOOPS

CHALLENGE COMPANY

Address Railroad Department **BATAVIA, ILL.**



SPECIFY

STEEL RAILWAY SERVICE TANKS

FOR

PERMANENCE AND NEGLIGIBLE MAINTENANCE COST

WRITE FOR RAILWAY BOOKLET NO. 28

We manufacture and erect Elevated Steel Tanks and Standpipes for every service

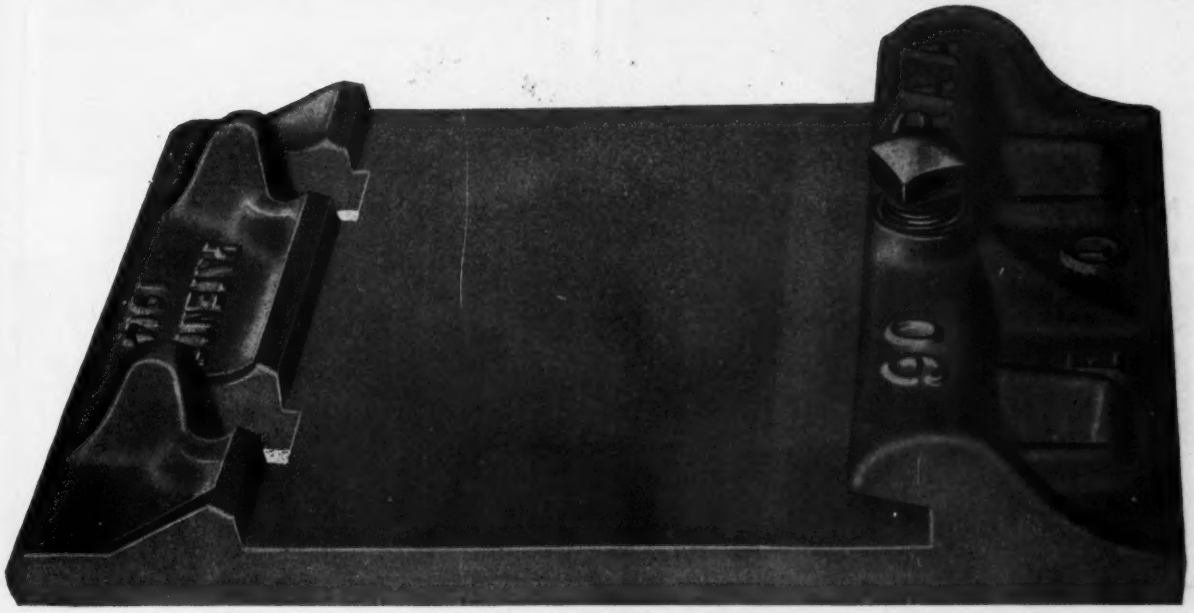
Pittsburgh-Des Moines Steel Co.

Pittsburgh, Pa., 920 Curry Building. New York City, 55 Church St. San Francisco, Cal., 5000 Rialto Building. Chicago, Ill., 1290 First National Bank Bldg. Havana, Cuba, Room 165 Nova Scotia Bank Building. Dallas, Texas, 1285 Praetorian Building

Des Moines Bridge & Iron Co.

Des Moines, Iowa, 912 Tuttle St.

Thomas Rail Anchor Tie Plate



Full Control—Not Half Control

When you control in the direction of traffic alone, you are doing half as much as you should do. Your traffic ceases for a time and other forces get to work and partially undo what you have done. If you had started with whole control in the first place, you would keep it, both under traffic and *non*-traffic conditions.

The THOMAS RAIL ANCHOR TIE PLATE is positively effective in both directions from the moment it is installed, and remains so. It does not depend upon *motion* to make it *effective.*

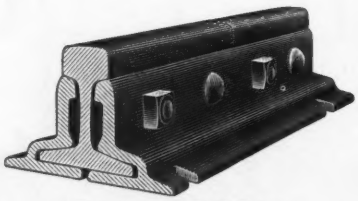
Chicago Malleable Castings Company

120th Street and S. Racine Avenue WEST PULLMAN, CHICAGO

The Rail Joint Co.

GENERAL OFFICES:

61 Broadway New York City



Continuous Rail Joint

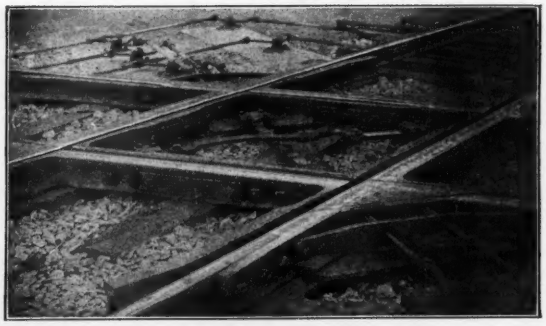
Makers of Continuous, Weber, Wolhaupter and 100% rail joints.

Standard—Insulated—Step—Frog and Switch Types.

Grand Prize San Francisco 1915

Protected by Patents

Cut Out the Blow by Filling the Gap. Eliminate Pounding and Save in Crossing Maintenance



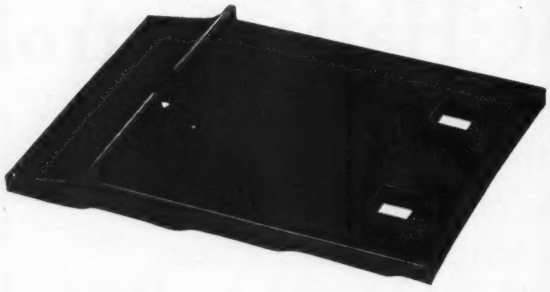
INSTALL THE

EYMON
Continuous Crossing

—operated with but one lever from the tower —It fills the gap, making a continuous, smooth-riding rail which removes the cause for wear and reduces the cost of upkeep.

The Eymon Continuous Crossing saves the equivalent of its initial cost every two years. Proved by actual service tests. Write for records.

Eymon Continuous Crossing Co.
Marion Ohio



One of the most distinguished, successful and honored Engineers of the United States, while not wishing his name to appear in an advertisement, writes as follows of The

LUNDIE TIE PLATE

"It is by far the most scientifically designed and practically efficient tie plate ever evolved."

JOHN LUNDIE, 52 Broadway, NEW YORK

1/4 of 100 = 0

"Impossible!" you say. Not at all. One quarter of a Century of service and nothing expended for repairs. That is how the seeming impossible is made possible by the use of

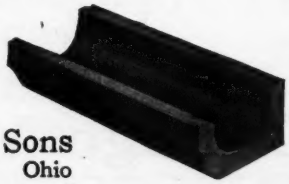
TRADE E.M. LONG & SONS CADIZ OHIO IMPROVED O.G. FIR GUTTERS MARK

O. G. FIR GUTTERS

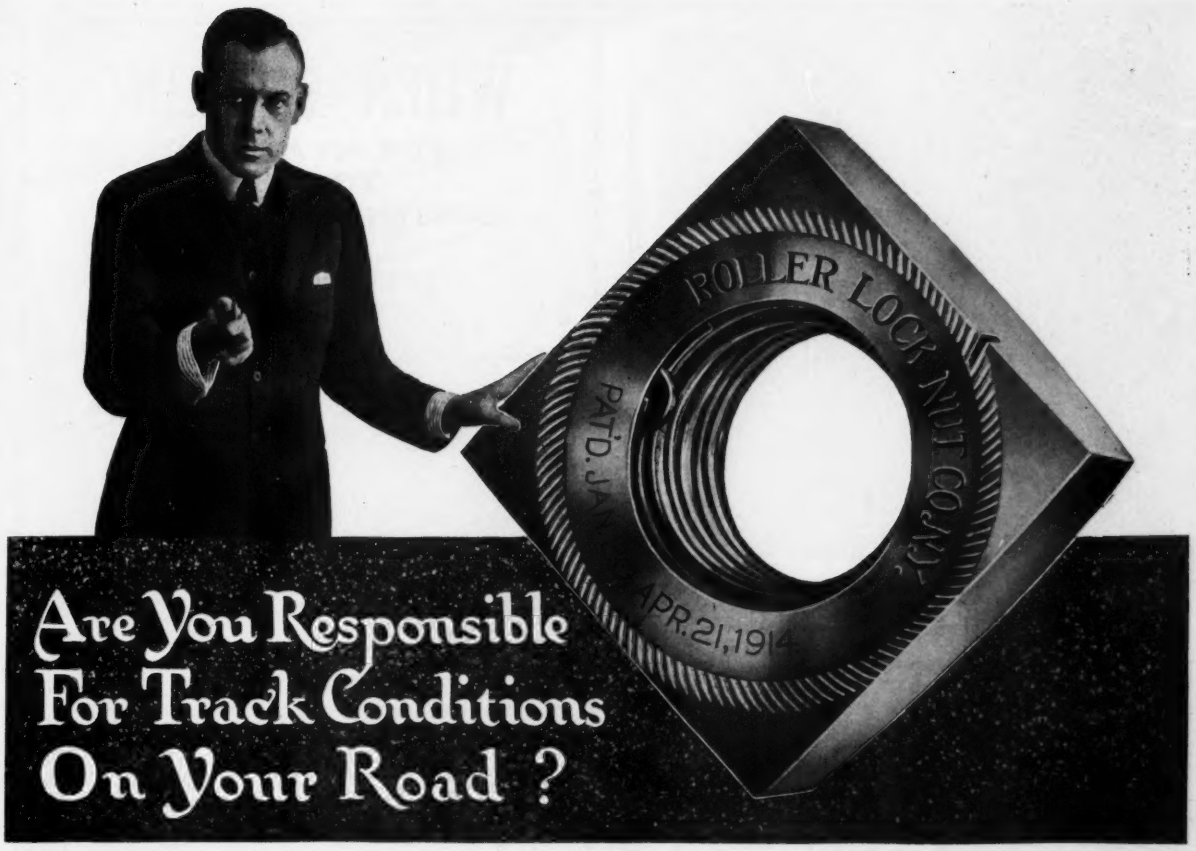
"Unusual!" You are right, they are unusual gutters. The reason is in the wood. Made of straight grain, decay resisting Douglas Fir, they are immune to the ravages of time and the action of the elements, smoke and chemical fumes.

Lower in first cost than copper and tin, they are guaranteed to last three times as long. There is a double saving in their use, which is why these Gutters, made of Nature's own gutter material, are specified by eight leading railroads.

Our Booklet on Gutter Facts is your Guide to Lower Maintenance Costs.



E. M. Long & Sons
Cadiz Ohio



If so, you'll be interested in the results of tests made or being made by a number of leading railroads on the first and only self-tightening track nut ever produced—The Roller Lock Nut. These tests were made in actual service on some of their worst stretches of track, with such good results that many of them now specify

Roller Lock Nuts on Crossings, Frogs and Switches

These track Lock Nuts are put on and taken off like a plain nut, and once in place, stay put. The severest vibration only makes them self-tighten, so that they take care of the bolt stretch. A strong wrench pull unlocks this nut, and it can easily be removed and re-used. The Roller Lock Nut is furnished almost finger tight, and can be installed in a fraction of the time required for friction track nuts and washers. In consequence, its cost installed on the track is no more than the cheap hot pressed track nut and washer. Owing to its size, shorter bolts can be used, and much of the expense for tightening loose nuts will be eliminated. The life of your crossings and frogs will be greatly increased, because they will be held tight and always in place. Tests on the severest of crossings have shown Roller Lock Nuts to get tighter instead of looser in track service.

Ask for details and samples.

Roller Lock Nut Co., Inc.

61 Broadway, - New York
9 North Jefferson St., Chicago

ROLLER LOCK NUT CO.
61 Broadway, N. Y. City.
Gentlemen:—Please send me samples and details of tests on Roller Lock Nuts.
Name.....
Address.....
R.M.E.5-17 Kind of work.....

TRACKOLINE

KILLS EVERY WEED TOP ROOT & SEED

Destroys Weeds

Horse-tail
*Johnson Grass
Bermuda Grass
Crab Grass

Old Friends in the Weed Family Make Tough Enemies on the Track

Trackoline is a highly concentrated chemical, most destructive to all weeds and grasses, yet guaranteed absolutely harmless to live stock. It not only kills vegetation, *top, root and seed,* and assures a clean track for the balance of the season, but greatly retards the growth of even the most hardy weeds the following season.

Trackoline will give you a clean track and save you money at the same time. There is not only a mile of clean track in each barrel of Trackoline, but there is no expensive apparatus required to obtain results.

*"TRACKOLINE was tried out on the grass we have down here (Mississippi) known as Johnson Grass, and we have found it first class. *It Killed Out Every Weed and Sprig of Grass* that was growing on the right of way."

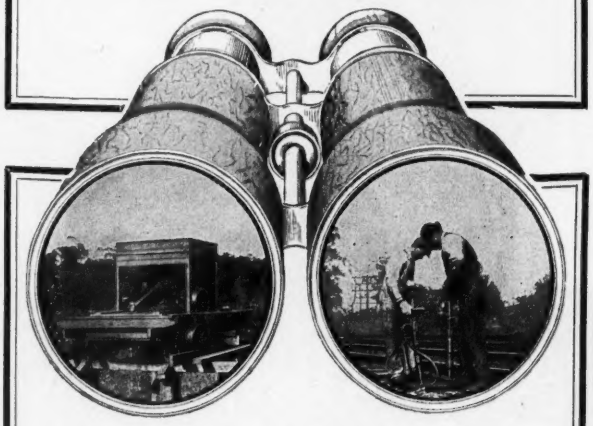
What Trackoline did for this road, it will do for your road—what it has done for hundreds of others it will do for you.

Send now for ***Trackoline Tracts or Facts on Clean Tracks and Lean Expenditures*** for Prevention of Vegetation. Don't let the grass grow under your feet—send today and learn how low the cost, how great the results of "Trackoline, the Weed Killer."

PROTECTIVE MATERIALS CORP.
Vanderbilt Bldg., 51 East 42nd Street
New York. N. Y.

WHEN LOOKING

FOR AN ANSWER TO THE MAINTENANCE PROBLEM



Have you considered the results obtained by users of

"IMPERIAL" TIE TAMPERS

Experience shows that "Imperial" Tampers:

Tamp any kind of ballast effectively.

Produce a more uniformly tamped track which is easier riding.

Tamp the ballast compactly under the tie—avoiding the formation of water pockets and reducing subsequent settlement.

Tamp around frogs, switches, cross-overs, water pans and other places impossible to reach with picks and bars.

Save labor—two men with "Imperial" Tampers will tamp more track than eight men with picks or bars.

Bulletin 9023

INGERSOLL-RAND COMPANY

11 Broadway, New York
Offices the World Over
165 Q. Victoria St., London

57 TT

Motor Car Safety

Mudge & Company

Railroad Specialties

Railway Exchange
Chicago

Burton W Mudge, President
Robert D Sinclair, Vice-President

April Tenth 1917

Dear Blake:

Written here are the names of several railway officials in your territory:

C. D. Purdon
E. A. Hadley
F. Ringer
A. F. Dorley
A. O. Cunningham
F. T. Hatch
R. H. Howard
L. F. Lonnbladh
H. E. Billman

These gentlemen are especially mentioned because of an almost certain knowledge that they will be glad to discuss with you the promotion of safety in motor car operation. We would not be keeping faith with them unless we make sure they know the advantages of our new "Standard Safety" car.

Although this class GS-3 car was designed for section use, it is, as you know, equally well fitted for valuation work, inspection parties and for hauling telegraph and signal gangs.

All of the following special features guard against and eliminate minor accidents which are constantly occurring:

(1) The heavy wire netting at both ends prevents the men falling off; avoids dangerous loading; holds small tools in place.
(2) The lights, front and rear, provide safety for night travel.
(3) The deep side rails guard against contact with turning wheels.
(4) Grab-rods at each end bring ease and safety in mounting; Center grab-rods are for security while car is running.

Men, long experienced in motor car operation, tell us they dislike to ride the open type cars after sensing the safety of this new car.

It strikes me that the officials you see will be as enthusiastic about this car as those already familiar with it. Don't you agree with me?

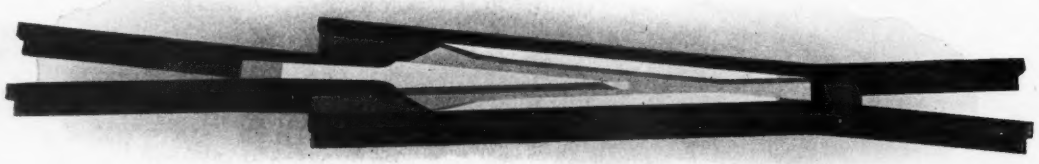
Cordially yours,

PERSONAL
Mr. Blake C. Howard,
St. Louis Representative,
Saint Louis,
Missouri.

BWM-A

Some REASONS WHY You Should ADOPT the M.T.S. Standard Rail-bound MANGANESE STEEL FROG

In preference to any other design



1. The design is the result of the combined experience and careful study of the leading Manufacturers of Special Track Work and Manganese Steel Founders, composing the Manganese Track Society and the Manganese Steel Founders' Society.
2. It combines the most desirable features of all previous types of frog, with several notable new features added.
3. It has received favorable notice of the Track Committee of the American Railway Engineering Association, and the Complete Rules for laying out the design for any angle and rail-section have been ordered printed in the Proceedings of the A. R. E. A.

Detail drawings of this frog, of any standard angles from No. 4 to No. 20, gladly furnished upon request.

Look up this space in next month's Maintenance Engineer for ADDITIONAL REASONS, or write for full particulars.

MANUFACTURED BY

WM. WHARTON JR. & CO., Incorp., Easton, Penna.

Track Chisel
Weight, 5 lbs.

Tie Tongs

Weight 15 Pounds

HUBBARD
Track Tools and Shovels

The "Hubbard" trademark on track tools and shovels is a guarantee of high-grade workmanship and material bought on analysis. Any tool that proves defective in any way will be promptly replaced without charge. Strong assertion, but the "Hubbard" trademark is your guarantee.

Since 1843, Hubbard & Co. have endeavored to maintain the highest standard of quality—have built up a reputation for integrity that makes the "Hubbard" trademark a means of identifying a product that measures up to railway men's standard for service.

Our catalogues will interest you. Send for them.

HUBBARD & COMPANY, Pittsburgh, Penna.

Square Point
Track Shovel

Are you saving Man-Power?

It takes the labor shortage to show you the extravagance of push trucks. You can't meet the shortage in man-power while you are wasting muscle in work that can be better done electrically.

The price of push trucks is about the same all the time, $5 to $100, but the price of labor is rising and laborers are getting fewer every day.

You pay less for push trucks. You must pay more for labor. Pay for an electric truck now and stop paying for unnecessary labor.

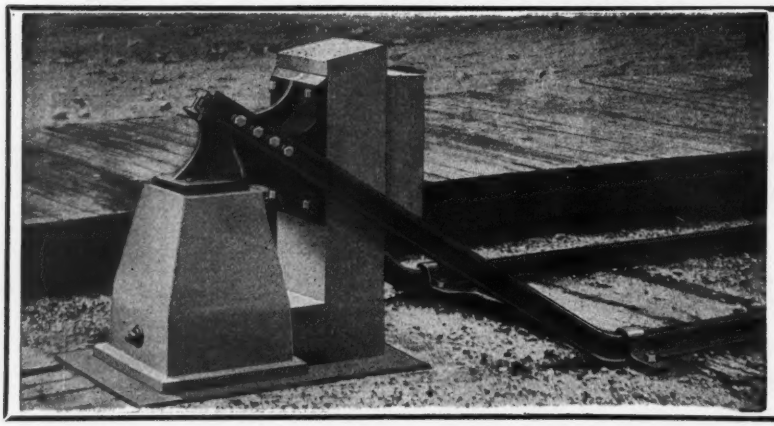
Refuse to consider the first cost of your trucks. Add the labor and you will buy electric trucks.

That's what sold Buda Trucks to the Santa Fe, the Pere Marquette, the C. B. & Q., the Soo Terminal warehouse and others.

New catalog just off the press will be sent on request.

THE BUDA COMPANY

608 Railway Exchange Bldg.,
Chicago



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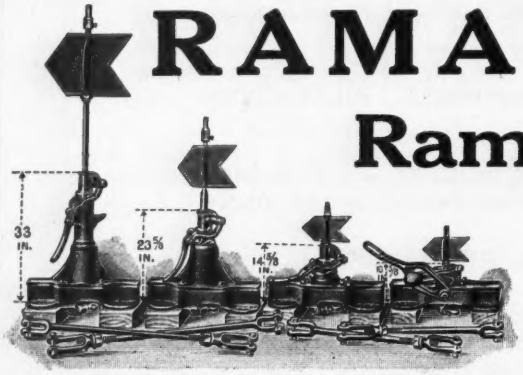

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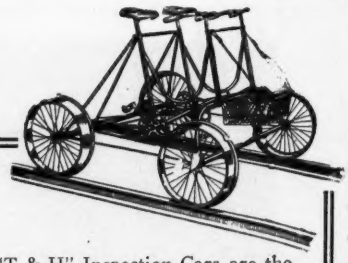

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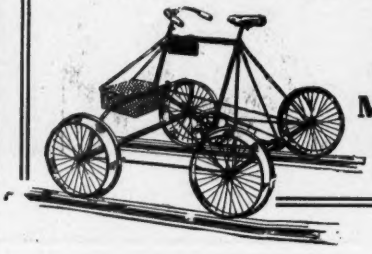

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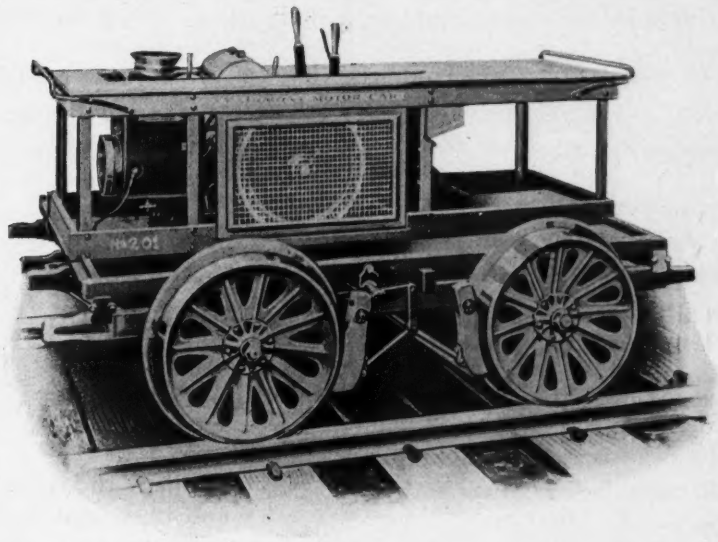

Men will not pump handcars over miles of track on a hot day when they can get more money for sitting comfortably at a bench or machine in a factory. No, it isn't human nature.

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—that will take the place of the old-fashioned plain bearings on your cars.

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It is the Hyatt Roller Bearing Replacement Box—the box that eliminates the sweating and puffing from your work.

With Hyatt Roller Bearing Boxes you can easily and quickly convert your present equipment into lively, easy-rolling cars.

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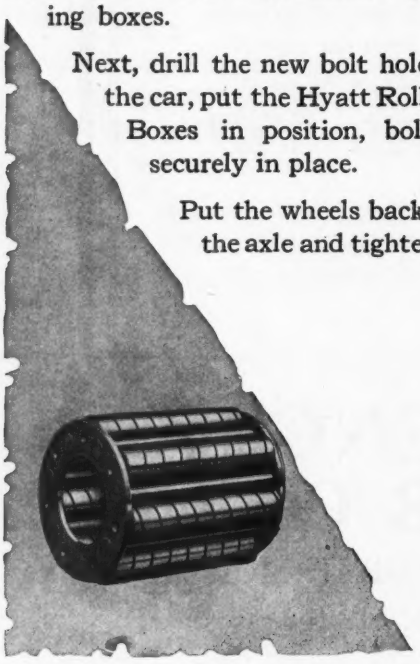
First, look at the list of manufacturers at the bottom of this page and select the manufacturer who can furnish the boxes you require.

Drop him a line and in a few days you will receive complete information—including prices that will make you anxious to get the boxes at once.

Then when you get the boxes and bearings, here is how they are applied:

Take off the nuts on the end of the axle and slip off the wheels.

Then remove the old-fashioned plain bearing boxes.



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Your car is now ready for the track.

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The Buda Company . . . . . Chicago, Illinois
Boxes for all hand and push cars

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Boxes for motor cars

Fairmont Gas Eng. and Ry. Motor Car Co. . . Fairmont, Minn.
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Northwestern Motor Co. . . . . Eau Claire, Wisconsin
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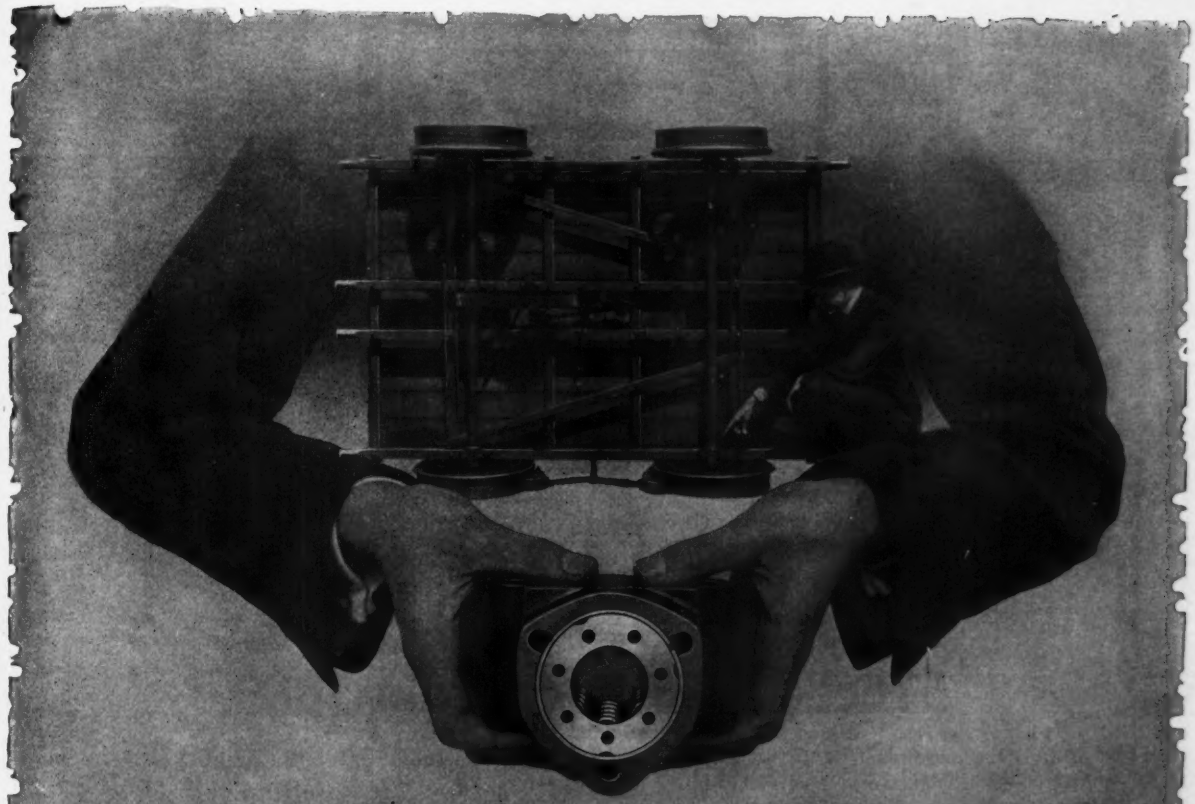

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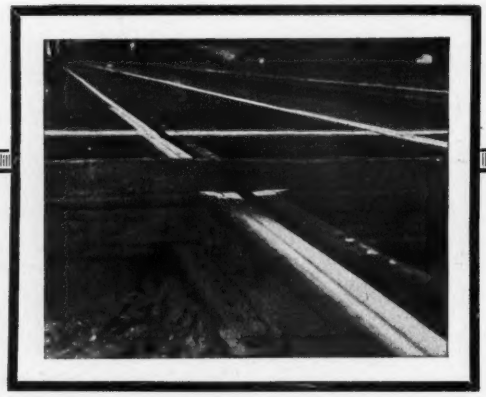

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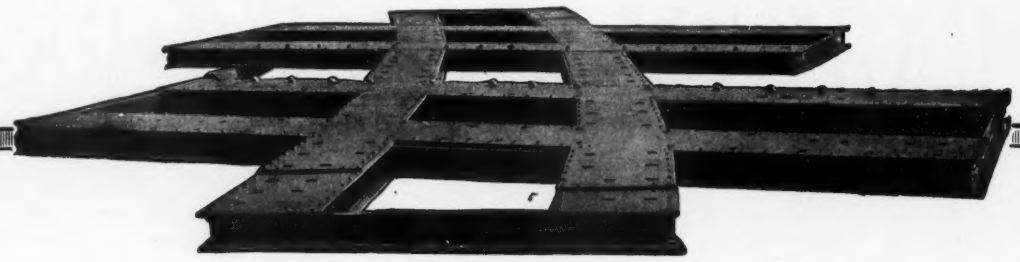

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An interesting commentary on the increasingly rapid adoption of motor cars for maintenance of way gangs is afforded by the statement of the receiver in the last annual report of the Chicago, Rock Island & Pacific, that the purchase of 759 new motor cars for section gangs and 95 motor cars for bridge gangs has been approved, and that the estimated savings will approximate $450,000. Another railroad has recently received the initial shipment of an ultimate order of 500 cars by means of which it expects to secure a similar saving, while the Lehigh Valley has ordered 149 motor cars, or sufficient to replace the last hand cars on the road. With the 182 cars previously owned, this line of less than 1,500 miles will have 331 motor cars. It is less than 10 years ago that the motor car was first seriously advocated for the use of maintenance of way gangs. Yet to-day it is estimated that there are 35,000 cars in use and they are being purchased more rapidly than ever before. The reason prompting this is, of course, the general realization of their economy.

Increasing Use of Motor Cars

Every slow order is a hindrance to operation. In the execution of some classes of maintenance of way work speed restrictions cannot be avoided if safety of operation is to be assured; in others they can be eliminated by additional expenditures, the justification for which varies with the density and character of the traffic subjected to interference. In general, slow orders are resorted to at times on all lines, including those with heavy traffic. To reduce the interference with trains as much as possible the speed limits should be made as high as practical, consistent with safety (always reducing rather than raising the limit in case of doubt). However, to do this safely it is necessary that engineers observe the restrictions placed with reasonable accuracy. This is not always done; in fact, speed restrictions are exceeded regularly on some roads with the knowledge of the operating officers. Nothing is gained by this lax practice, for the experienced supervisor only places his restrictions lower, and failure to enforce orders of this kind soon leads to disregard of others and ultimately to accident. Operating officers owe it to the maintenance of way department to enforce all speed restrictions as rigidly as any other orders. When an engineer knows that an order limiting speed to 20 miles an hour means that and not 35 miles, he will observe it, and the supervisors will be able to place their limits at the speeds for which they consider the track safe. As observed at present on many roads, slow orders are prepared for the violator rather than the observer, a practice which unnecessarily delays those trains complying with them and leads nowhere except to disaster.

Observe the Slow Order

With new rails selling for $40 per ton and with labor scarce, inefficient and expensive, it is important for each railway to secure the maximum life from the rails it has in service. Not all roads are studying their rail allotments and their renewal programs as carefully as they might. It is natural for the local division officers to ask for all the rail that they think they can secure, for their first interest is

Conservation of Rails

to maintain good track. Under this condition, unless these requests are reviewed by some higher officer, rail will be removed in many cases before its full life is secured. On one large road where the supervision in this respect had been somewhat lax, a change in the system resulted in a reduction of several thousand tons in the annual requirements of new rails. On another road a certain stretch of rail which was first placed on the budget for renewal by the division officers four years ago was not renewed until last spring and was still in fairly good condition. While the first consideration in the renewal of rail should be that of insuring safety to traffic, the amount of money invested in rails is so large that they should not be removed until their condition warrants it. After coming out of the track a large part of the rails are still fit for further service, particularly if they are sorted, straightened and the battered ends removed. The Chicago, Milwaukee & St. Paul has been a pioneer in the reclamation of rails and the article in another column describing the practice on that road and the results obtained is of particular interest at this time when rails are so expensive.

CULTIVATING THE RIGHT OF WAY

THE land occupied by the right of way of American railroads has an area of about 5,000 square miles, or more than that of the entire state of Connecticut. No information is available from which it is possible to estimate the proportion of this large area which is suitable for cultivation, but taking into consideration the fact that most of the railway mileage of this country is located in territory having a topography suitable for high industrial and agricultural development, it is plain that by far the greater part of it can be used for growing crops.

That it has required a condition of war to demonstrate the need of putting this vast area under cultivation is explained by the fact that this is a new country and that the value placed on land has in consequence been low, as compared with that in European countries, where the intensive use of land has been practiced for years. However, with the rapid increase in population and the enormous advance in the cost of food, the pressure to place all available land under cultivation will be constantly greater, and if it is found that railway rights of way can be utilized profitably during times of war, the practice of cultivating these lands will undoubtedly be continued during times of peace. It may also be found that the leasing of small plots of ground to section laborers will offer one solution for the track-labor problem. In many places section foremen are using the right of way for their kitchen gardens.

The administration of any such plans for the use of the right of way, particularly by persons not employees, imposes some new problems for the maintenance of way department, and because it will involve personal dealings with a great many different individuals, the responsibility will fall very largely on the section foremen. There will also be a need for the formulation of standard rules and regulations which will require the attention of the roadmaster and his superiors. The cultivation of railway land may or may not reduce the expense of mowing the right of way. It will have definite disadvantages, however, resulting from the presence on the right of way of many persons not connected with the railroad. The foremen will be compelled to give greater attention to the repair of fences and the closing of gates; they will need to see that the tenants are not causing obstructions to ditches or injuries to telegraph poles, signal trunking, etc. But still more important will be the vigilance which they will be compelled to exercise to see that the tenants are taking the proper precautions to prevent injury to themselves or their horses, and that they keep wagons and other equipment at a safe distance from the tracks.

Such duties require the exercise of tact, firmness, fairness and impartiality. In other words, these added duties will further increase the need of foremen of high intelligence who are fit to serve as the railways' representatives, agents and the custodians of its property.

MORE SUPERVISION NEEDED

ONE of the greatest handicaps under which the maintenance of way department is now operating is that of inadequate supervision. While this criticism applies to all branches of railway operation, it is particularly pertinent in the maintenance of way department. The employees of the mechanical department are concentrated almost entirely in groups at the terminals, where many of those in the transportation department are similarly located. On the other hand, the employees engaged in the maintenance of way and structures are scattered over every mile of line, greatly increasing the difficulty of supervision. Furthermore, the class of labor employed in this work is much inferior to that in the mechanical and transportation departments and, therefore, requires a greater relative amount of supervision. In spite of these facts, only slightly more per employee is being spent for supervision in the maintenance of way department than in these other two departments. This illustrates the serious inadequacy of the supervision of the maintenance of way department, which is spending over $450,000,000 annually for maintenance of way purposes directly, and a vast additional amount for work charged to additions and betterments.

This lack of supervision extends all through the department, from the chief engineer maintenance of way to the smallest gang. Frequently it results from giving a man a greater amount of territory than he can cover adequately. This applies particularly to supervisors. Their place is out on the line with their gangs, for it is here that the money is being spent. Yet frequently a supervisor is given so much territory that it is impossible to give each foreman the attention he should have. As a result mistakes occur, inefficient methods are employed and the company pays the bills.

No one standard can be set for the amount of territory a man can cover properly, for this depends almost entirely on local conditions, including the amount of work under way, its distribution over the line, the readiness with which the territory can be covered by trains, motor cars, etc. The real measure is not a uniform mileage for all supervisors, but that mileage which enables each man to give the work the attention it deserves.

Inadequate supervision also results frequently from lack of clerical and other assistance in the office. Many supervisors have to spend a considerable part of their time checking payrolls, signing requests for transportation, making out requisitions for materials and writing numerous reports long-hand, all of which a clerk can do better and cheaper, and at the same time they are taking time from the work out on the line where their services are the most valuable to the roads.

The demands upon the railroads for economies, and particularly this year, for the conservation of labor, are so great that the managements can well afford to study the problem of supervision in the maintenance of way department most carefully. Few roads have adequate supervision today, while nearly all roads are paying out relatively large sums for losses which could be prevented

by ample supervision. It is significant that the most efficient methods are most generally found on those roads which have the greatest amount of supervision, as indicated by the fact that it is to those roads that others go for the latest information concerning improved practices.

THE MAINTENANCE DEPARTMENT IN WAR

THE maintenance of railway tracks and structures in condition to permit traffic to move without interruption is necessary to the welfare of the country at any time. It is vital to our existence in times of war when the ability to transfer men and materials from one point to another quickly may prevent disaster. Our government has recently shown its realization of this fact by the rapidity with which it has placed troops on guard at bridges, tunnels and other strategic points on the railways.

Railway employees as a class have a high patriotic duty to perform in maintaining the continuity of transportation. No group has a greater responsibility than the men in the maintenance of way department, since few things so demoralizes railway operation as derailments and other accidents at congested points, and it is within the province of the maintenance of way department to provide roadbeds over which troops and supplies can be moved safely and expeditiously. It is to be expected that the men in this department will rise to the full measure of their responsibilities in every way, and will maintain their long-established record of loyalty to their companies, and, in this instance, to the country.

Much as the enlistment of men from all industries is to be desired, railway men should also consider that they are performing a patriotic duty in remaining at their posts and doing their part to insure the continuity of transportation. The presidents of the Burlington, the Long Island and other railways have emphasized this fact in letters to their employees. The President of the United States gave voice to the same sentiments in his proclamation of April 15, when he said: "To the men who run the railways of the country, whether they be managers or operative employees, let me say that the railways are the arteries of the nation's life and that upon them rests the immense responsibility of seeing to it that those arteries suffer no obstruction of any kind, no inefficiency or slackened power."

One way in which the maintenance of way department can assist in insuring continuity of operation is in being more than usually alert to detect those who may be disposed to attempt the destruction of railway property. The men of this department are distributed over every mile of our railways and, therefore, have an unusual opportunity to observe any suspicious actions and to detect any evidences of contemplated destruction.

Another way in which the men of this branch of the service can be of aid to the government this year is in conserving the labor available to the greatest possible extent. This will lead to the elimination of strikes and labor disturbances which were so prevalant last year. While it is probably too much to expect that all of these troubles can be eliminated among the men commonly employed in maintenance of way gangs, they can be reduced by the exercise of tact in meeting them and by pointing out the possible disastrous results. The conservation of labor can also be promoted to the greatest possible extent by the use of labor-saving equipment. With the serious inroads which enlistment and the necessary employment of men in the manufacture of war materials are creating it is necessary to replace labor wherever possible in order to increase the amount of work which can be done. Foremen, supervisors and others can aid in this by giving careful attention to methods and by eliminating lost motion wherever possible. In other words, although those measures have been advisable previously from economic reasons, within the last month another and more important reason has been added by the entrance of our country into the great war.

CO-OPERATION IN DESIGN

ALTHOUGH the maintenance and construction organizations are likely to be independent on most railroads, they bear a definite relation to each other which is all too frequently overlooked. Economy of maintenance is influenced very largely by the quality of design and construction, and correct design and construction cannot be secured unless information concerning service records on construction work previously completed, and particularly as to any difficulties experienced in maintenance, is brought to the attention of the construction department.

This is well illustrated by an incident that took place on a certain railroad in connection with the construction of a new roundhouse. When the installation of the boiler washout pipes was under consideration it was decided to try a new type of valve equipped with wearing parts that are made removable so that they can be replaced readily when worn out without requiring the renewal of the entire valve. After this house had been in service for some time a number of these valves commenced to leak. As the roundhouse foreman and the master carpenter, to whom he complained, were entirely unfamiliar with the construction of these valves, the latter made a requisition for new valves to replace the seemingly defective ones. It was only by chance that this error was discovered and the difficulty corrected.

The common tendency for maintenance field forces, particularly where they do a considerable portion of the construction work on smaller bridges and buildings, is to depart from the plans furnished them in order to correct certain defects which they have discovered rather than take the trouble to explain the matter to those responsible for the design. In consequence plans will frequently show as standard details that have long been abandoned. The excuse given for this practice by the field men is that their recommendations and criticisms are ignored, to which the office men reply that the reports of such difficulties are not explained in sufficient detail to make them intelligible and that the only way in which the designer can get authentic information is to make a personal inspection.

New materials and new forms of construction are being put into use constantly. The general tendency is, of course, toward better design and construction, but unless the designers are kept advised as to the service received, and particularly as to features resulting in difficult maintenance, many expensive mistakes will be repeated. In justice to the maintenance men it must be said that many of these errors could be avoided in the first place if they were called into consultation before the designs were completed. Co-operation is a fundamental requirement and each department must come half-way.

THE MOUNT ROYAL TUNNEL—This project of the Canadian Northern is completed with the exception of the track laying. The excavation is in progress on the site of the permanent station. Six electric locomotives are in course of construction and will shortly be in operation.

LETTERS TO THE EDITOR

A GRADUATED WAGE SCALE

MARLIN, TEX.

TO THE EDITOR:

The two articles on the foreman situation in the recent issues of the *Railway Maintenance Engineer* by H. G. Clark and A. Augustine are excellent. If we had some plan whereby we could hold men it would result in a big saving to the company and would also be a great relief to the foreman. I think a good plan would be to raise the wage a little at a time until a man would be drawing pay that would be worth while. We would soon have good gangs and the men would have something to work for. We now hire a man at $1.25 per day who knows that if he makes good he will never get any more and that if he does just enough to get by he will receive the same pay. If the section foreman and roadmaster could give the best of these men a little raise from time to time they would have something to work for and we would soon have good men.

F. F. RODGERS,
Section Foreman, International & Great Northern.

OILING TRACK BOLTS

PARKER CITY, IND.

TO THE EDITOR:

I have made a practice of oiling track bolts for the last four years beginning shortly after new rail was laid on my section in 1912 and 1913. The bolts were not properly tightened by the steel gang and in the Spring of 1914 I found that they were very loose and so rusted that when we attempted to tighten them an average of one to two bolts per joint twisted off. This was becoming rather expensive for the company, so I started oiling the bolts with common black oil. This made it possible to tighten most of them up snug to the angle bar. The few that would not tighten up properly were broken out and replaced with new ones.

Since that time I have made it a practice to oil the bolts Spring and Fall, and find that they keep in good shape and do not rust very much from the salt drippings from refrigerator cars. I have just completed the oiling and tightening them for the first time this Spring and used only ¼ keg of bolts for replacements in 5½ miles of line. The tighter the foreman can keep the bolts the less low joints there will be on his section. A foreman will make better progress if he does not try to carry too many given kinds of work at one time. In consequence he will secure better results when he starts to tighten bolts if he will continue the work until finished.

N. H. ROBERTS.
Section Foreman, C. C. C. & St. L.

NEW BOOKS

The Trackman's Helper. Revised and enlarged by Richard T. Dana, consulting engineer, and A. F. Trimble, special agent in the general manager's office of the Erie. 384 pages, 85 illustrations, 4 in. by 6¼ in. Bound in leather. Published by the Clark Book Company, Inc., New York. Price $2.00.

This book was prepared originally by J. Kindelan, in 1894, and revised by F. A. Smith, F. R. Coates and Jerry Sullivan. In preparing the present edition the authors have kept in mind the necessity of restricting it to the field of track work, of writing it in simple, readable language and of putting it out in a form enabling it to be carried in the pocket for ready reference. The book is well written and printed and covers a wide variety of topics of interest to the track man in a concise way. Liberal quotations are made from current technical literature on the subject. The book contains much information which will be of definite assistance to supervisors of track, foremen and others interested in this phase of maintenance of way work.

The book is divided into 23 chapters, with headings as follows: Construction, Spiking and Gaging, General Spring Work, Drainage, Summer Track Work, Cutting Weeds, Ballasting, Renewal of Rails, Effects of the Wave Motion of Rail on Track Rail Movements, General Fall Track Work, Building Fences, General Winter Work, Bucking Snow, Laying Out Curves, Elevation of Curves, Lining Curves, Special Conditions on Mountain Roads, Frogs and Switches, Use and Care of Track Tools, Tie Plates, Wrecking, General Instructions and Practical Hints for Trackmen.

Proceedings of the American Railway Bridge and Building Association. Edited by the secretary. 268 pages, illustrated, 6 in. by 9 in. Bound in cloth and paper. Published by the Association, C. A. Lichty, secretary, Chicago & North Western, Chicago. Price $1.

The proceedings of this association constitute an important annual addition to the literature concerning the maintenance of railway structures, including, as this association does, the combined viewpoints and experiences of the technical designer and of the field man. The reports are prepared on carefully selected subjects, while the discussions bring out much additional valuable material. The reports presented at the twenty-sixth annual convention at New Orleans last October were not exceptions to this rule, those on Intakes and Intake Lines; Paint and Its Application to Railway Structures; Modern Methods of Driving Piles and Methods of Handling Concrete Economically on the Smaller Jobs being particularly valuable. Other reports were also presented on Floors for Engine Houses, Shops and Freight Houses; Caring for and Handling Creosoted Timber; Efficient Methods of Handling Work and Men; Station Buildings for Passenger Service Only, and Small Coaling Stations.

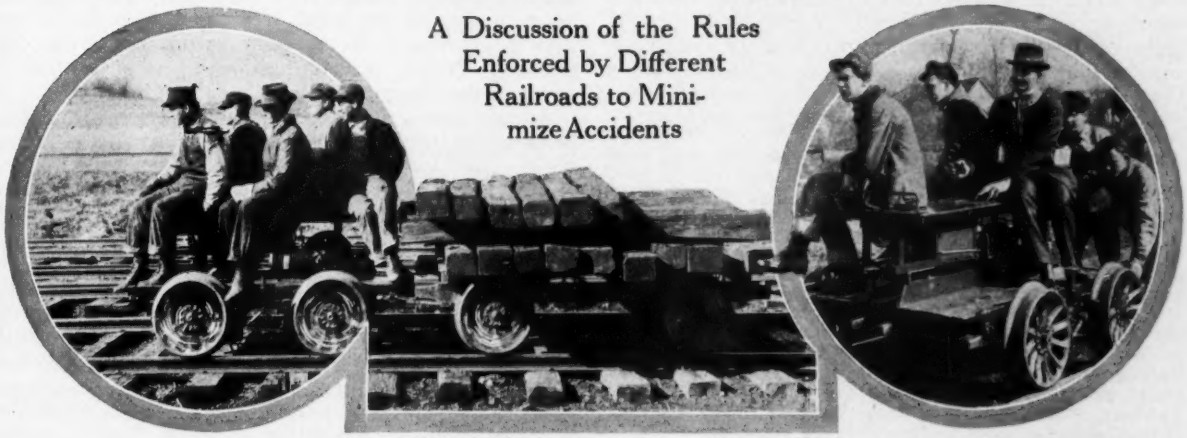
Concrete, Plain and Reinforced. By Frederick W. Taylor and Sanford E. Thompson. 885 pages, illustrated, 6 in. by 9 in. Bound in cloth. Third edition. Published by John Wiley & Sons, 432 Fourth Avenue, New York. Price $5.00.

The form of this well-known text on concrete has not been changed materially from that in which it appeared in the second edition, the purpose of its latest appearance being solely to record the more recent developments in this branch of engineering. The first third of the book is devoted to the subject of plain concrete and includes chapters on the principles of the theory and practice of proportioning, the properties of the ingredients, their preparation and mixing, and the depositing of the concrete. Space is also given to the influence of various destructive agencies, watertightness and the strength of plain concrete. As the fundamental principles and construction methods have become more thoroughly established, it has been possible to condense this portion of the book into 348 pages as compared with 398 in the second edition.

The principles of reinforced concrete cover 256 pages, divided into three chapters, theory, tests, and design, and have been very largely rewritten from the previous material. The practice in building construction occupies 61 pages as compared with 31 pages in the previous edition, and more space is devoted to the actual details of design and construction. The later chapters of the book contain expositions of the various forms of construction, including arches, retaining walls, pavements, sidewalks, tunnels, etc.

REGULATION OF MOTOR CAR OPERATION

A Discussion of the Rules Enforced by Different Railroads to Minimize Accidents



WHEN motor cars were first introduced for the use of section, bridge and other maintenance of way gangs six or seven years ago they were confined almost entirely to branch lines with few trains where it was possible to secure the maximum economies by extending the sections to greater lengths than are practicable with hand cars. However, as their advantages became more evident, the use of these cars has increased until to-day they are found on main as well as branch lines, on heavy traffic lines as well as those with only one train each way per day and on sections with heavy curvature as well as on prairie lines. As a result, from the experimental stage of seven years ago, they have come to be considered standard equipment on many roads and it is estimated that at least 35,000 motor cars are in service to-day.

There is no longer any question regarding the economy of motor cars for maintenance of way gangs under ordinary conditions. At the same time, there is a wide variation in the extent to which they are being used on different lines. Some roads, such as the Pennsylvania Lines West, are not using them at all for maintenance gangs, this road having only one motor car in service on its 3,100 miles of line, and this car being in the valuation department. Other roads are replacing the hand car with the motor car almost universally, the Lehigh Valley recently substituted motor cars for the last of its hand cars and is now operating 332 motor cars on its line of less than 1,500 miles. The Chicago & North-Western has over 1,200 motor cars in use, while the Illinois Central has 663, and numerous other roads are similarly well supplied.

In investigating the reasons why the wide difference of practice exists regarding the adoption of motor cars, one finds that the fear that their use will lead to an increase in the number of accidents has been an important retarding influence. This fear is particularly in evidence on lines of dense traffic and heavy curvature, although, as noted above, the Lehigh Valley has equipped its lines throughout with motor cars, notwithstanding the fact that it is one of heavy curvature and frequent high-speed trains.

While it is true that accidents occur in the operation of motor cars, they are encountered also with hand cars and it has been the experience of the roads using motor cars extensively that when their operation is protected by adequate rules properly enforced, the number of accidents is not greater than with hand cars. The Southern Pacific is operating 150 motor cars on main as well as branch lines, restricting their use only on the heavy grades in the mountains and on lines of heavy curvature affording a limited view of the track. With these limitations there have been almost no accidents. The New York Central has experienced only three accidents with 44 motor cars since they were first introduced in 1912, one of which was the result of a direct violation of the rules through the use of a car by an employee not on duty on Sunday and the other two came about through the receipt of incorrect information regarding trains from telegraph operators. The Chicago & North-Western has replaced nearly all of its hand cars with motor cars, restricting their use only in suburban and other dense traffic districts where there are two or more tracks, where it is difficult to find room to place the cars removed from the tracks, and where the same limitations apply to hand cars. Here again it is not believed that accidents are more frequent with motor cars than with other types. On some roads it is believed that the number of accidents has actually been decreased by the installation of motor cars because of the greater attention given to the instruction of the men on the prevention of accidents and also because of the desire of the foremen to protect their cars in order to avoid the necessity of returning to hand car operation.

From their nature, motor cars are subject to certain accidents not inherent in hand cars. For instance, the rules of a number of roads require gasolene tanks and pipes to be examined fequently to see that they do not leak, the use of lighted lanterns and torches near gasolene tanks or pipes is forbidden and where it is necessary to work on a car at night the car must be taken outside the tool house. It is also forbidden to build a fire under the car in cold weather to warm it up.

The rules of the Chicago Great Western require, further, that when not in use the cars shall be placed under shelter or covered with canvas, and that they must be kept locked with a chain or padlock. When in use all cars must be inspected daily and where repairs are needed and the foreman is unable to make them he must report their condition at once to his superior officers, who will arrange for such repairs. In operating the cars this road further requires the gasolene to be shut off at the tank when stops are made for more than three minutes, while the oil cup must be closed and battery switches must be taken off the contact at every stop.

CLASSIFICATION OF ACCIDENTS

The accidents that occur in the operation of motor cars may be classified under two heads: those incurred

at the beginning or end of a trip and those that happen while the car is in motion. One important western road, which operates 411 cars, investigated the accidents occurring in 1916 (69 in number) and found that 15 occurred in preparation for a trip or at its completion and 54 while the car was in motion. The compilation is given below:

In Preparation for a Trip.

Causes	Section and other maintenance gangs	Roadmasters, Inspectors, etc.	Total
Lifting car on or off	7	1	8
Fell while getting on	2	2	4
Fell while getting off	2	0	2
Fell while pushing	1	0	1
Total	12	3	15

With the Car in Motion.

Derailments	26	3	29
Collisions	10	1	11
Fell off car	4	1	5
Defective appliances	3	0	3
Tools and materials insecure	2	0	2
Sudden stops	1	0	1
Feet striking obstructions	0	1	1
Other causes	1	1	2
Total	47	7	54

It is evident that the accidents occurring from the causes enumerated in the first group should not be more frequent or any more serious with motor cars than with hand cars. With regard to the accidents in the second group, it is to be expected that these may be more numerous and more serious with the greater speed at which it is possible for motor cars to travel. However, accidents of this kind have been eliminated to a great extent by the adoption of precautionary regulations limiting the speeds at which the cars may be operated. When motor cars were first introduced little attention was paid to restrictions of this character and they were operated frequently at speeds as high as 35 miles per hour. It is, therefore, not surprising that frequent accidents resulted from this practice and that the results were more serious when they did occur.

RULES FOR OPERATING CARS

This led to the preparation of rules by the various railroads covering the local conditions encountered on the different lines. Some roads carry the idea of preparing the rules with reference to local conditions still further, the Norfolk & Western leaving this matter to the officers of each division.

From a comparison of the regulations prescribed in the rules of the various roads, it appears that while some rules are of purely local application, others are almost universally enforced. These rules cover the allowable speeds, persons allowed to ride, the equipment to be carried, the use of flags and torpedoes, the headway of cars and their operation under special conditions.

The speed at which cars may be operated is governed by rules on some roads and by mechanical limitations in the design of the car itself on others. It appears to be the general impression that 15 miles per hour is the maximum speed consistent with safety, although the Erie and the Minneapolis & St. Louis set the limit at 20 miles, and some roads are operating successfully with the maximum set at 25 miles per hour. The Northern Pacific and the Great Northern control the speed of cars by mechanical means through restrictions on the multiplication of the transmission.

Through territory where special conditions are encountered as at yards, approaching public streets or highway crossings, etc., it is the general practice to require further restrictions. The Chicago Great Western and many other roads limit the speed over frogs and switches to five miles per hour. When approaching highways the Great Western requires the speed to be reduced so that a full stop may be made if necessary before getting on the crossing. If the view of the crossing is obstructed in any way the car must come to a full stop.

Another rule generally enforced prescribes who shall be permitted to ride, although this rule has many variations. The Chicago Great Western enforces the following: "Only employees whose work requires them to do so will be permitted to ride upon motor, push or hand cars. Women and children must not be allowed on these cars at any time. The use of motor or hand cars for other than company business will be cause for the dismissal of the foreman permitting it." The Baltimore & Ohio requires that all persons using motor cars must first provide themselves with permits signed by the general manager.

It is generally required that cars in use must be equipped at all times with the necessary flagging equipment and that torpedoes exploded be replaced. The Illinois Central requires all motor cars to carry six torpedoes, two red flags and one current time-table. The cars must not be run after working hours except by authority from the superintendent or in emergency. In such cases, in addition to the equipment mentioned above, each car must carry four red fusees, two red lanterns and two white lanterns.

To minimize the danger of collision it is very generally required that lookouts be maintained in both directions for approaching trains. The Erie requires a flagman to be sent out with danger signals to provide the necessary protection where there is not a clear view of the track for a sufficient distance to insure safety. The Northern Pacific requires flagging in both directions where the view is not clear for a distance exceeding 1,500 ft. On those roads which operate under manual-danger signals, the men secure advance warnings of trains from the signal indications, greatly lessening the danger of their being struck by trains.

A rule generally enforced to prevent collisions between motor cars prescribes the minimum distance to be maintained between cars running in the same direction. On the Erie this distance is set at 200 ft., while on the Great Western it is 600 ft. The practice of running cars close behind or attached to locomotives or cars in a train or between standing passenger trains and depots is generally prohibited.

Other rules prescribe the course of action to be followed under special conditions. The Erie forbids the running of gasolene motor cars against the current of traffic on double track if it can be avoided. It is further forbidden to use the cars on a main track during blinding storms or in foggy weather except in an emergency and in such cases it is required that they be protected by danger signals. When obliged to run cars after dark, or in tunnels, in addition to providing the necessary protection it is required that a white light be displayed in front and a red light on the rear, so placed as to be visible from approaching trains.

RUNNING MOTOR CARS AS EXTRA TRAINS

In addition to the common or general rules given above, other rules have been adopted by some roads where operating conditions are difficult. The Western Maryland, which is largely a single-track road, crosses both the Blue Ridge and the Allegheny mountains, with heavy grades and curvature and numerous bridges and tunnels of considerable length. The road is equipped with automatic signals, and although the absolute permissive sys-

tem of single-track signaling is used, making it possible to operate motor cars with considerable safety by signal indication, all motor cars are run as extra trains under train orders from the despatcher and by rule, and all persons operating motor cars are trained along lines similar to the men employed in train service. They are required to pass an examination for color blindness, as well as on the book of rules, time-tables, the movement of trains by train orders, and the physical characteristics of the road over which they operated their cars.

The motor cars leave their initial stations as extras, displaying signals and markers. The meeting points with opposing trains of the same class are fixed by train orders with wait orders on opposing second-class trains. They clear the time of first-class trains as required by rule. Trains of superior class are cleared according to rule if on their scheduled time and if running late this information is given to the operator of the motor car on regular order forms so the delayed time can be used.

Each car is numbered the same as an engine, the numbers being 5-in. white enamel figures on a black background displayed on both the front and rear of the cars. Each car is equipped with an 8-in. trip gong, sounding an alarm when necessary. No one is allowed to operate a car alone. The orders are taken directly from the despatcher by telephone except at offices where operators are on duty. In addition to the telephones at station and block offices, telephones are also located at the end of passing sidings, watchmen's boxes and other convenient places.

The Pennsylvania Railroad, which has about 200 cars in service, also protects their movements by block rules that in effect are practically the same as those applying to freight trains. On this road the cars are equipped with portable telephone sets for attaching to the despatchers' wire for orders when in districts remote from telegraph offices. While this causes some slight delay when the foremen desire to go from one part of their sections to another, and particularly when starting work in the morning, the latter condition has been modified largely by having the men report for duty at different times in the morning and by anticipating their movements during the day. On many other roads the operators and despatchers are required to give the foremen information concerning trains when requested.

OTHER RULES

In contrast with this refinement of operation shown above, a more typical practice is that on the Northern Pacific where motor cars are in use by about 30 per cent of the section crews, and by all of the signal maintainers and linemen as well as being generally used by the roadmasters and other officers. On this road there are no positive rules governing their use, but instead the cars are operated under general safety instructions, some of which are shown below.

The following practices are prohibited:

Operating motor cars to exceed 15 miles per hour.

Operating a motor car rapidly while passing any standing train. (Persons may unexpectedly step from between the cars and be injured. When necessary to pass trains the car should be pushed.)

Operating motor cars on double track against the current of traffic except to get by a disabled train or other obstruction, unless under the protection of a flag, if the view is in any way obstructed.

Passing a train in motion on double track. (Cars must be stopped.)

Operating hand or motor cars without making a test of the brakes after starting to ascertain whether they are in good working condition.

Approaching highway crossings, places where track gangs or other forces are employed on tracks or bridges, except with the car under full control and prepared to stop instantly.

Loading tools except in such manner as to prevent their falling off and derailing a car. (Small tools should be kept in a box or bag.)

Operating hand or motor cars following a train at a less distance than five telegraph poles, and hand or motor cars or hand speeders following each other at a less distance than one telegraph pole.

Passing interlocking plants where a stop signal is displayed before ascertaining that all switches and derails are in position to pass over without derailment. (If the signal is at proceed it indicates that the route is clear, but cars must be run over interlocking switches and derails at slow speed, prepared to stop at once, as the towerman is liable to throw a switch under the car. On single track in automatic block signal territory do not pass a signal that is set at stop or caution, but remove the car from the track as quickly as possible, as it indicates that a train is approaching. A signal set at stop in the opposite direction means that a train is following you.)

Running over switches or frogs at a speed exceeding five miles per hour and without shutting off the gasolene on motor cars. (Cars should be pushed through spring frogs.)

Operating cars without a sufficient number of men to remove them from the track quickly. (If absolutely necessary to go out with a car not sufficiently manned, a careful understanding of the position of trains must be obtained at each open telegraph office.)

Operating cars so loaded with tools or material as to prevent them from being removed from the track quickly, except under protection or flag or authority from the train despatcher.

Operating cars over track that is being raised, or recently has been raised, or in districts where work trains have recently distributed gravel or other materials, without having the car under control and maintaining a sharp lookout for stones or other obstacles on the tracks.

Stopping any place to do work without first removing the car from the track and keeping it off the track until the work has been completed and the gang is ready to proceed.

Shipping motor cars from one point to another by train without first draining all gasolene from the tank as required by law.

The use of cars for other than company business, and their operation except by duly authorized persons. The carrying of persons other than employees on duty, except in case of an accident when a doctor is required promptly.

Boarding a moving motor or hand car, either from the front or side.

Another type of accident incident to the operation of motor cars and also to hand cars is that resulting from tools falling in front of the cars, derailing them and frequently throwing men under the wheels. While men may be injured seriously in accidents on hand cars, this danger is more serious with motor cars because of the higher speed at which they are operated. This calls for a more careful placing of the tools on the cars so that they cannot become dislodged and fall off. To avoid accidents of this character one road is using a motor car equipped with a heavy frame and grating across each end of the car, the frame supporting the grating and also providing hand holds for the men, while the grating itself prevents tools from falling in front of the car. With equipment such as this, accidents of this character should be eliminated.

From the above it is evident that the installation of motor cars, like any other special equipment, requires the preparation and enforcement of rules to prevent their abuse. Where attention has been given to this subject the experiences of the roads which are using the cars in largest numbers generally indicate that the fear of increased accidents to men is unfounded.

THE THEORY OF DRYING.—The problem of seasoning lumber is one of wide interest and has occupied the United States Forest Products Laboratory for some time. The results of recent investigations are given in Bulletin No. 509,, United States Department of Agriculture. This covers the principles of drying, types of kilns, the use of steam, proper piling of the lumber, etc.

ENLARGING A BUSY TUNNEL UNDER TRAFFIC

Details of the Method by Which the Pennsylvania Is Increasing the Clearance of Its Bore Under Baltimore

THE Pennsylvania Railroad is now engaged in enlarging its Baltimore & Potomac tunnel under the city of Baltimore, Md., to permit the use of larger equipment. The work is being done under heavy traffic and consists of the lowering of the grade of the tracks about 2 ft. 6 in., the building of a new concrete invert, the dressing off of the rock face of the old tunnel walls to secure a minimum horizontal clearance of 27 ft. and the building of concrete splicing chambers and conduits for power and signal wires.

The tunnel carries the main tracks of the Philadelphia, Baltimore & Washington line of the Pennsylvania and all of the Pennsylvania traffic between Philadelphia and Washington passes over these tracks. In addition, the tunnel is used by all passenger trains of the Western Maryland as an entrance to the Union station. A total of more than 200 train movements are made through it every 24 hours.

Because of the limited section in the tunnel the work of enlargement could not be carried on with both tracks in operation. Consequently, it has been necessary to operate through the tunnel with a single track during the construction. Existing interlocking towers at each end facilitate the control of trains through this single track district and existing yards north and south of the tunnel provide the trackage for trains awaiting opportunity to pass through the tunnel.

As a precautionary measure and also to partially relieve the congestion on this single track a detour was provided before the work was begun. This was secured by extending the Green Spring branch of the Pennsylvania to a connection with the Western Maryland tracks and building a wye connection between the Philadelphia, Baltimore & Washington tracks, and those of the Western Maryland, near the junction of the two roads south of the south portal of the tunnel. This detour is used daily by 24 Western Maryland trains and 8 Pennsylvania trains. It also provides a means of detouring all trains in case of an accident in the single track district.

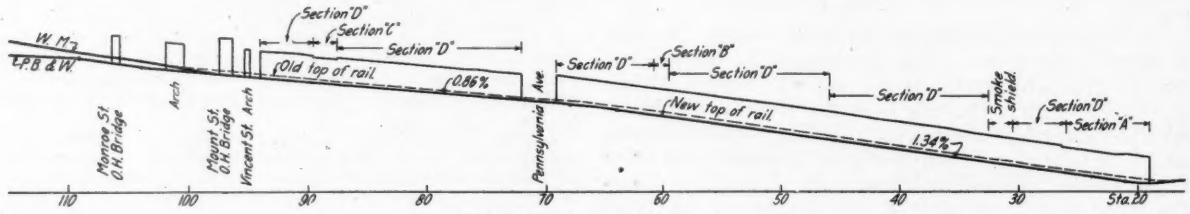
Western Maryland trains passing over the detour use the tracks of the Northern Central railroad from the Union station to Hollins and then pass over the Green Spring branch of the Pennsylvania and its new extension to their own tracks. The Pennsylvania trains follow the same route to the Western Maryland tracks and reach their own rails by way of the new wye connection.

THE OLD TUNNEL

The old tunnel was built for double track and is 7,497 ft. long. It extends from North avenue, which is about 800 ft. south of the Baltimore Union Station, south to Gilmor street. It was built in 1873 and consists of masonry bench walls and a brick arch ring. As may be seen from the drawings it was not built to a uniform cross-section. Of the total length, 700 ft. was built according to section A, 132 ft. to section B, 300 ft. to section C, 5,964 ft. to section D, 202 ft. was enclosed by a smoke shield and 299 ft. was built as an open cut at Pennsylvania avenue to serve the station at that point. The minimum clearances were encountered in section C.

The line through the tunnel includes 2,043 ft. of curvature. Beginning at the north portal, the line through section A includes 326 ft. of 7-deg. 20-min. curve and 167 ft. of 4-deg. curve. Section D includes 647 ft. of 4-deg. curve, 352 ft. of 7-deg. 30-min. curve and 29 ft. of 1-deg. curve. The line is tangent through section B. Through section C it includes 104 ft. of 1-deg. curve. The remaining curvature is included in the open cut at Pennsylvania avenue and in the smoke shield section.

When first built the horizontal clearances in the various sections of the tunnel were ample to permit double track operation with the equipment then in service, but as the size of the equipment increased considerable difficulty has been experienced in securing the proper side clearance around the curves. Temporary relief was secured by shifting the tracks in at the close points, but before the improvement was begun the tracks had been thrown in to the limit consistent with safety and the track centers varied from 11 ft. 6 in. to 12 ft. The enlarged tunnel will provide space for two tracks spaced 12 ft. 6 in. center to center and a side clearance of 7 ft. 3 in. from the center of the track to the adjacent tunnel wall or a total distance of 27 ft. in the clear.



PROFILE OF THE TUNNEL

CONSTRUCTION METHODS

In spite of the artificial ventilation of the tunnel provided by means of a fan at the Pennsylvania avenue open cut which supplies fresh air and another fan at North avenue which withdraws the foul air, it was necessary to erect a smoke shield to protect the workmen from the hot gases from locomotives passing on the adjacent track before construction work was started. This shield consists of a timber frame partition built up to a height of about eight ft. above the rail at the proper clearance from the running track with a sloping roof extending from the partition into the arch ring. Asbestos board was first used to cover the frame, but it did not withstand the action of the gases and moisture and ⅞-in. boards were substituted in the later work. Flash boards were installed on top of the barricade to prevent smoke from mushrooming into the cabs of passing locomotives.

By referring to the plan showing the old and new sections, it is seen that the horizontal clearance is being enlarged by dressing off the rock face of the bench walls

vertically downward from the arch ring at the springing line. This work is heaviest in sections A and C, which were built with inclined bench walls, thus reducing the clearance below the springing line.

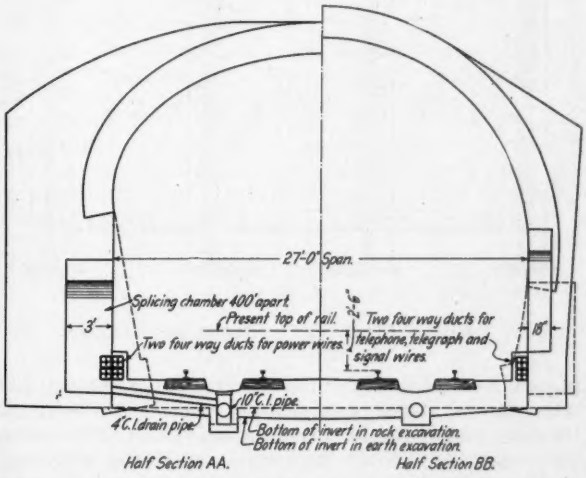
The material is removed by drilling a series of ½-in. holes about 10 in. apart and breaking the rock off by driving wedges in these holes after 10 or 12 have been prepared. As the tunnel was built with an offset of 3 in. at the springing line, it was convenient to start the drills at this elevation, the drilling being done at this height from a scaffold. In general, one drilling to each course of stone is sufficient.

This work is done on a square foot basis and a total area of 78,000 sq. ft. was covered in enlarging the north bound track side. The average area covered per man per day varied with the nature of the stone and the working conditions, but when working on the ground a general average of 30 sq. ft. was maintained. The daily performance was less when it was necessary to work from the scaffold.

In lowering the tracks the depth of the excavation varies with the material encountered. In earth it is carried down to an elevation of about 3 ft. below the grade of the new top of rail; in rock it is stopped about 8 in. higher, the difference being taken up in the concrete invert. Where rock is found it is moved by small charges of dynamite placed in holes drilled about 2 ft. apart, 2 to 7 holes being shot at the same time.

The earth and rock are moved from the tunnel in narrow gage equipment hauled by dinkey engines over a narrow gage track formed by pulling in the rails of the abandoned main track. For convenience the track is elevated slightly at the dump which is located outside the north portal of the tunnel. A stiff-leg derrick is provided here to reload the material into standard gage equipment, which is hauled to the waste bank at Canton by road locomotives.

Because of the lack of space at the south end of the tunnel, the construction plant to carry on the work is

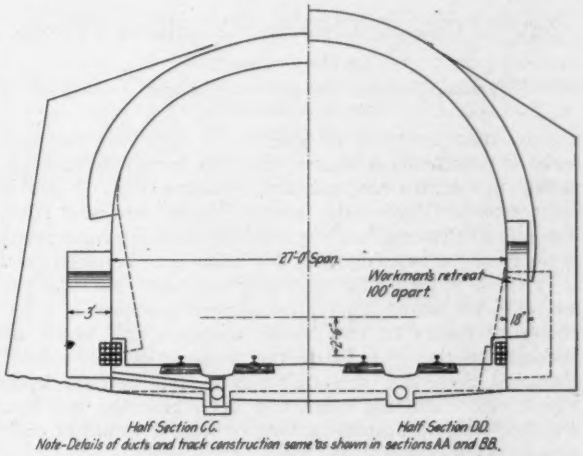

27'-0" Span.
Splicing chamber 400' apart.
Present top of rail.
3'
Two four way ducts for power wires.
Two four way ducts for telephone, telegraph and signal wires.
18"
10" C.I. pipe.
4" C.I. drain pipe.
Bottom of invert in rock excavation.
Bottom of invert in earth excavation.
Half Section AA.
Half Section BB.

HALF SECTIONS A AND B

located at the north end. It consists of a material track, a stiff-leg derrick, an elevated concrete mixing platform with the material bins placed above the 1-yd. mixer, and shops for repairing and sharpening tools. The concrete materials are brought in by trains to the construction plant and are dumped on a platform from which they are handled by the derrick to the material bins placed above the mixer. They then drop by gravity to the mixer and from it the mixed concrete is dumped into cars which are hauled to place by dinkey engines.

The concrete invert is built with a crown at the center line between tracks and slopes down on a pitch of ¼ in. to 1 ft. to an open drain between the rails of each track. A similar slope is provided from the tunnel walls. The terra cotta multiple ducts for the power and signal wires are protected by 3 in. of concrete built as a part of the invert.

At intervals of 400 ft. recesses 8 ft. long and 3 ft. deep are provided as splicing chambers. They are built



HALF SECTIONS C AND D

by removing a section of the stone tunnel wall to the height of the springing line of the arch and substituting concrete. The recesses are closed off from the tunnel by means of sliding doors. Small recesses 18 in. deep by 4 ft. wide and 6 ft. 3 in. high are also provided at intervals of 100 ft. as retreats for workmen.

In addition to the open drain built as a part of the invert a 10-in. cast iron pipe line is placed about 18 in. below the grade of the open drain in the center of each track. The open drain and the pipe are connected at intervals of 100 ft. by means of manholes provided with traps and covered with cast iron grating. The transverse drains from the splicing chambers are of 4-in. cast iron pipes.

The track through the tunnel is placed directly on the concrete. Blocks of wood 2 ft. 6 in. long on top and 2 ft. 10 in. on the bottom and 7 in. deep, securely anchored to the concrete by 1-in. bolts 15½ in. long, replace the ties. The bolts are fitted with washers and square nuts and are placed inside papier-mache tubes. The wood blocks are equipped with six-hole tie plates and the rails are fastened to them by six screw spikes. Tie-rods, spaced 8 ft. apart, are provided between the two rails of a track.

The work of enlarging this tunnel was begun on the north bound track in June, 1916, and was completed on February 2, 1917. The work was then temporarily abandoned and double track operation resumed during the increased traffic incident to the inauguration of the President. Shortly after this time the improvement of the south bound track was begun and is now under way.

The project is being carried on under the general direction of A. C. Shand, chief engineer of the Pennsylvania, and H. C. Booz, assistant chief engineer. J. W. Craig, assistant engineer, is in direct charge of the work. Arthur McMullen & Melvin Company of New York City is the contractor.

RECLAIMING STRUCTURAL MATERIALS

Discussions of Different Phases of This Important Subject by Four Contributors to the Contest

FOUR contributions to the contest on the Reclamation of Bridge and Building Materials, including the two prize-winning papers, were published in the *Railway Maintenance Engineer* for April. Four other papers entered in this contest are given below:

SALVAGING SECOND-HAND GIRDER SPANS

By S. J. Corey,
Chief Draftsman, Bridge Department, Chicago, Rock Island & Pacific, Chicago, Ill.

Now that the price of steel is so high that that material is practically a luxury, the bridge engineer is compelled to utilize second-hand material to a maximum extent. Even with normal prices for new steel, considerable savings may be made by shifting light spans from main to branch lines, providing due consideration is given to probable future traffic increases upon the latter. On the other hand, this is poor economy if it becomes necessary to rehabilitate within a few years, on account of the growth of the "heavier-power zones." Probably there are few railroads in this country upon which this "shifting" has not been resorted to; but, whether with an ultimate saving or loss, it would be difficlut to say.

The Chicago, Rock Island & Pacific has thousands of tons of second-hand steel in service today which has been re-erected in the past 15 years, and a considerable percentage of this is on main lines. These spans consist of through-pin truss spans, originally for double track, made over into single-track spans, but with floors of new material; through-lattice truss spans, strengthened and corrected for eccentricity on re-erection; deck-plate girder spans, usually four-ply, made by doubling up two old spans; I-beam slab tops made from old I-beams from open-deck bridges; deck-plate girder spans made from old floor beams and stringers which had been taken from through-truss spans.

The reuse of second-hand steel in this manner is not advisable, unless the resulting structure gives as large a margin for future increases of live load as a new steel span. It has been the practice on the Rock Island to apply standard specifications for loading and stresses in rebuilding the second-hand structures, and consequently they are as good as new ones. In fact, in many cases the rebuilt bridge will carry ultimately very much heavier loads than the new one. This is true particularly with the four-ply girder spans made from girders originally built in the nineties.

On the large western roads, where the rehabilitation of the bridges has been proceeding slowly but surely for the past 15 years, the accumulation of second-hand spans has been enormous and their reuse has not kept pace with their release. Only via the scrap heap has it been possible to keep the material yards clear. Of course, it is manifestly impossible to use all second-hand spans. The bridge engineer must keep a list of the available material, and when the permanent list for the coming year is made, the second-hand list is scanned and the assignments are made. It may be necessary to make slight adjustments in length to fit the material, but in most cases these can readily be made.

On the Rock Island great numbers of girder spans, ranging from 20 to 60 ft., have been replaced with new and heavier steel, and, except for the scrapping of those spans which are in such bad condition as to make their reuse inadvisable, nearly all have been remodeled and placed in service again.

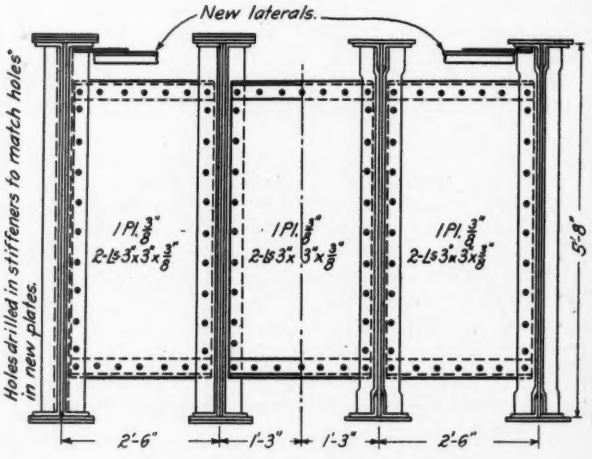
The accompanying tabulation shows some interesting data collected from actual bridges, the superstructures of which have been replaced by remodeled spans. The data is self-explanatory.

60-Ft. Deck Plate Girder Span Remodeled.

The span was made from two second-hand spans built in 1886 and designed for two 85½-ton engines. Each span weighed 38,476 lb. They were removed from the main line upon the introduction of heavier power equivalent to a Cooper's classification of E-55, while the old spans rated but E-45 at a maximum unit stress of 22,000 lb. per sq. in. on the net section. After the work of remodeling was completed, the total weight of the span was as follows:

Four girders	69,336 lb.
New material	4,332 lb.
Miscellaneous second-hand material	3,603 lb.
Total	77,271 lb.

The field work consisted of cutting the old spans apart, as they were riveted up complete on removal from the



Cross-Section of a Remodled Span

former location. This involved removing the old laterals, lateral plates and cross-frames. New material for diaphragms and lateral plates was ordered from the bridge company, while the lateral angles and stiffening angles for the diaphragms were cut from the old laterals and cross-frames. The entire field labor necessitated cutting out 560 shop rivets, drilling 600 holes, making 144 angle cuts and driving 1,270 field rivets. The actual cost of this field labor was $262, and the work was done by the regluar bridge-erection crew.

With steel at $50 per ton and assuming second-hand girders to be worth $20 per ton, the cost of a new 60-ft. deck-plate girder span, designed for E-55 loading, according to the American Railway Engineering Association specifications for stress and impact, would be ap-

proximately $1,500, while that of the remodeled span may be figured as follows:

Second-hand material, 36.5 tons, at $20	$ 730
New material, 2.2 tons, at $60	132
Field labor	262
	$1,124

The remodeled span, providing the steel is in fair condition, will carry as heavy ultimate loads as a new span, and it costs less with a fair valuation of second-hand material.

ONE 34-FT. DECK PLATE GIRDER SPAN REMODELED.

Four second-hand girders	23,856 lb.
Miscellaneous second-hand material	932 lb.
New material (including castings)	5,780 lb.
Total	30,568 lb.
Field work:	
Cutting out rivets	300
Drilling holes	550
Cuts	104
Driving rivets	1,340

The actual cost of field labor was $160. This is low, owing to the fact that 8 or 10 spans were remodeled simultaneously. This cost, as well as that given for the 60-ft. span, includes assembling, but not erection. The accompanying drawing shows the manner in which the old girders were put together.

Estimated cost for the 34-ft. span:	
Second-hand material, 12½ tons, at $20	$250
New material, 2.9 tons (actual cost)	156
Field labor (actual cost)	160
Total	$566

Estimated cost of a new 34-ft. deck-plate girder span, designed for E-55 loading, according to "A. R. E. A." specifications, is 11 tons at $50=$550.

From a purely financial standpoint, and, of coruse, depending upon unit prices assumed in the comparison, it is seen that the short remodeled span will cost as much as, if not more than, the new span with steel prices normal. The showing, however, would be more favorable if normal scrap prices, i. e., $10 to $15 per ton, were used for the old material. One advantage, however, lies in the fact that the second-hand material is immediately available. With steel prices at the prevailing figure, approximately $100 per ton, and scrap at $30, the new span would cost $1,100, as against approximately $825 for the remodeled span, a material saving which may be effected during the next year or two, or at least until the war ceases.

RECLAIMING LUMBER FROM A COAL DOCK

BY G. L. MOORE
Engineer Maintenance of Way, Lehigh Valley, South Bethlehem, Pa.

Since the completion of the Lehigh Valley between the anthracite coal regions and Perth Amboy, N. J., in 1875, a large proportion of the shipments of coal, for water delivery, has been handled through this port, where the company owns extensive water frontage. Here the railway maintained a series of coal docks, which were recently replaced by a more modern structure. These consisted of adjoining parallel trestles, from which the coal was dumped from the cars into large bins underneath. The floors of the bins sloped towards gates along the sides, whence the coal could be drawn off as desired into cars, on "tunnel tracks" located midway between and parallel to the adjoining trestles and lines of bins. These coal trestles, which were constructed almost entirely of timber and piling, comprised a total of 373 bins, and accommodated 10 unloading tracks each 870 ft. in length, exclusive of approaches. The material composing these structures included 6,629,500 ft. b. m. of yellow pine; 100,300 ft. b. m. of Oregon fir; 49,600 ft. of b. m. spruce braces, 18 to 20 ft. long, and 5,608 creosoted piles, 12 to 37 ft. long, besides a large quantity of bolts, cast washers, separators, drift bolts, rods, cast-iron water mains and specials for fire lines.

Upon the completion of a modern car dumper in 1914, by means of which coal is dumped direct from cars to boats, it was decided to abandon the bins and studies were made as to the best method for wrecking the bins and trestles to obtain the maximum amount of salvage, with the least expense. Outside of the track material, this salvage, of course, depended entirely on the amount of useful timber which would be obtained, and with this fact in mind, a portable sawmill was purchased and installed immediately adjacent to the work.

The dismantling and handling of the timber was done almost entirely with locomotive cranes, an arrangement which reduced the cost of the work to a minimum. All materials were graded as they were removed; those which required no resawing being loaded on one set of cars, while those which it was necessary to put through the mill were loaded onto others. The switching and delivery of cars to the mill was done by the cranes. No track expense was incurred, the old "tunnel tracks" being utilized in the operations. The mill was located between two parallel tracks; the timber for resawing was delivered on one track to be unloaded on skids, where it was cleaned of all spikes and bolts. It was then run through the mill and immediately loaded onto cars standing on the other track on the opposite side of the mill, ready for shipment.

With the exception of a few of the floor struts and side planks of the tunnels, and some of the floor planks of the bins, all the material removed was utilized for some purpose; large timbers, even rotted on four sides, were resawed, and sufficient first-class material obtained from the sound portions to more than cover the expense of handling. Large quantities of 1-in., 2-in. and 3-in. boards and planking, 6-in. x 8-in. guard stringers, studding of various sizes, bridge ties, cross ties, switch timber and various other timbers, were manufactured at the mill. Switch timber and ties were obtained mostly from the resawed creosoted yellow pine piles, and produced excellent material. Though a considerable quantity of timber was shipped to different points on the system, in sizes and lengths as removed from the structure, the requirements of other sizes were supplied, by resawing to order, at the mill. All slabs which otherwise would have been discarded were either cut in suitable lengths for use in firing up locomotives at the different company engine houses, or used for fuel under the boiler at the mill. In fact, with the facilities of the mill at hand, it was found profitable to utilize large amounts of material which had been heretofore considered absolutely useless. The sawdust was blown from underneath the saws directly into cars alongside the building at a very slight expense, to be utilized at the company's ice houses.

The wrecking or removal of the material from the structures and delivery of the timber for resawing to the mill was prosecuted at a rate that would allow the mill to be operated at maximum capacity.

The following summary shows the material salvaged from the coal storage structure:

Timber resawed into cross ties	74,510 ft. b. m.
Timber resawed into bridge ties	18,696 ft. b. m.
Timber resawed into switch ties	150,770 ft. b. m.
Timber resawed into miscellaneous lumber	821,344 ft. b. m.
Total resawed	1,065,320 ft. b. m.

Unsawed timber	2,427,415 ft. b. m.
730 creosoted piles	182,000 ft. b. m.
7,213 fence posts	173,112 ft. b. m.
417 cars of engine wood	2,085,000 ft. b. m.
Total timber	5,923,847 ft. b. m.
25 cars of sawdust.	
Total cost of recovering the salvage, loading on cars, labor and supplies	$33,765.85
Locomotive crane service	2,469.50
Total	$36,235.35

In addition to the timber a large quantity of bolts, nuts, separators, cast-iron pipe, rail and scrap was recovered. A large part of the timber, especially that resawed, was as good as if purchased new.

The mill, besides handling the storage ground material, was used in sawing a quantity of timber cleared from a tract of ground on which the railroad constructed a large storage reservoir. A large number of second-hand bridge ties and stringers were also resawed, producing first-class material in smaller sizes.

The complete sawmill equipment was shipped early last summer to one of the western divisions, where it has since been in regular operation sawing timber cut from company lands.

RESAWING OLD LUMBER

By H. H. Brooke

General Foreman Bridge and Building Department, St. Louis—San Francisco, Chaffee, Mo.

The use of all kinds of second-hand material has become a hobby on the Frisco. Twenty per cent of the old bridge material is saved and used for many purposes. A new stringer, cap or tie is rarely used for bridge repairs. The best of the second-hand stringers are transferred to some of the older and weaker bridges, being put in as the fourth member of the chord and the best caps are used to replace defective caps that will not last another season. The second grade of second-hand stringers are used in bridges on private and public road crossings. The second-hand ties are redistributed in such a way that all weak and decayed ties which are liable to cause fire can be removed.

The surplus second-hand bridge material of all dimensions is shipped into the terminal where it is put through the mill, and sawed into suitable dimensions for sills, posts, rafters and sheathing. This lumber is used to build tool houses, coal houses, small passenger shelters and water closets, as the small buildings are all built on the shop platform and shipped to their destination on flat cars.

Through extensive use of second-hand material tool houses are now built for $45 which cost $110 when all new material was used. The frames of the new tool houses are made from lumber which is sawed from second-hand bridge material or second-hand car sills. These buildings are sided and roofed with second-hand metal car roofing, and no new material is used in them except the windows, doors and paint.

All sound pieces of second-hand bridge material which is too short for bridge repairs or building lumber is sawed into six-inch lengths and is used for block floors in machine shops and roundhouses. This material is shipped into the terminal and is sawed into these blocks at the mill, stored and kept ready for use.

Pile cut-offs are saved and shipped into the terminal and are redistributed for foundations for new freight and transfer platforms, and cotton platforms. Some are also used for blocking under some of the older buildings, and in the setting of coal and tool houses.

Fifty per cent of the hardware for bridge renewals is used the second time if it proves of the latest standard sizes. Bolts that are damaged to such an extent that precludes their reuse are cut and straightened for drifts to be used in bridge repair work, and bolts which cannot be used on account of defective threads are sent in to the reclamation plant, where they are straightened and rethreaded, and sent out again in the place of new material.

When old buildings are torn down the best lumber is assembled at the terminal and used in the construction of the small buildings made at the shop. The balance of the material, commonly known as scrap and which used to be considered worthless, is sent to the concrete gangs for bracing, runways and scaffolding.

STORING AND DISTRIBUTING OLD MATERIAL

By Geo. H. Richards

Superintendent of Bridge and Building Shops, C., M. & St. P., Tomah, Wis.

At the bridge and building shops of the Chicago, Milwaukee & St. Paul at Tomah, Wis., much use is made of second-hand timber and lumber. Bridge stringers that are too short for reuse in standard openings are resawed into sills for hand car houses, coal and oil houses and all outbuildings around the smaller stations. These sills are always given a treatment of carbolineum. This class of material is also used for skids in the lumber yard.

Bridge ties are also resawed, and all that are free from material defects are used for making spacing blocks for ties on steel bridges. Parts that are defective are used for blocking and spacers to load concrete pipe on flat cars. As a great many flat cars are loaded out of this yard for various purposes, stakes are always in demand, and these are secured from the second-hand material. The rippings from this resawing are used to crate up material that is not considered safe to ship open.

The 3-in. plank that is shipped in each season is cut to lengths that are multiples of 2 ft. and is used up on highway crossings or sent out in the Spring to the concrete crews for use as run plank and for the floors for concrete material piles.

Second-hand one-inch lumber is divided into three grades. The first grade consists of all lumber that will serve for concrete forms above the ground level, the second grade of all lumber that can be used for concrete forms below the ground line, and the third grade of all short pieces and pieces that have defects which can be cut out. This is used for the manufacture of boxes such as are used by the stores department for shipping switch bolts and other material. This works off very fast.

The 3-in. by 6-in. pieces received are separated into two grades—those that can be again used for concrete forms and the short lengths that will serve for short car stakes. All this material is graded when it is unloaded and each grade is kept separate. Cedar pile heads are sent to the mill to be made into shingles. Occasionally piles are sent in which have been pulled out of bridges abandoned because of line changes. These have later gone out as foundation piles for masonry structures.

A great deal of reclaiming of material is done at the company's car shops at Milwaukee, where more modern machinery is available. Here the second-hand bridge material is worked up largely into floors for flat cars, and all that is not fit for this purpose is made into coal and grain doors. A considerable saving in the handling of second-hand stringers, ties and timber is made at Tomah through the handling, loading and unloading of this material by the two locomotive cranes.

THE RESAWING OF LUMBER*

BY D. C. CURTIS
Inspector of Stores, Chicago, Burlington & Quincy, Chicago.

Lumber is one of the materials used in large quantities on railroads. It is not only expensive, but is constantly increasing in cost. As in the case of any material that is used and carried in stock, the user of lumber loses sight of its intrinsic value and it has been a hard task to educate him to save all surplus and ship it to the storekeeper for reclamation. The practice on the Chicago, Burlington & Quincy is to give specific instructions to the heads of the various departments ordering lumber regarding its value and the possibilities for its reuse by reclaiming and resawing. The general manager has also issued instructions providing that all unused lumber must be returned to the storekeeper.

The largest amount of reclaimed lumber is returned from wooden bridges which are being replaced by permanent structures. The principal yield is from caps and stringers. It is difficult to get reclaimed material of any length from ties, as the ends are usually more or less rotted and have to be sawed off. For this reason it is necessary to resaw most of the second-hand lumber from bridges and buildings as it is used for purposes entirely different from the original and in other sizes. To provide the sizes needed, resaw plants were installed at Galesburg, Ill., and at Havelock, Neb. The Galesburg plant has a Berlin No. 3 pony band saw with a 30-ft. carriage, and a circular 36-in. cut-off saw, both electrically operated. The plant is roofed over and provided with rollers, a saw sharpener and similar facilities. This will saw lumber 20-in. wide by 30-ft. long. It is operated by a sawyer and four helpers. Two helpers bring the lumber to the saw and two take it away, pile it properly or load it directly into cars for shipment. The labor cost is 35 cents per 1,000 ft. b. m. on the resaw and 20 to 28 cents on the cut-off saw plant.

All second-hand lumber is unloaded and sorted when received, and is sawed up as orders come in. This makes it possible to work up the lumber to the best possible advantage for each order received. A large saving has been made by resawing new lumber into special sizes not carried in stock, saving the premium demanded in the open market for special size lumber. This plant saves $6,000 per year.

The Havelock resaw plant consists of a 52-in. circular saw and a 55-ft. table built by the Lane Manufacturing Company. It is made in three sections fitted with couplings so that either one, any two or all three sections may be used as desired. There is also a cut-off saw with rollers, etc., as in the Galesburg plant. A circular saw has an advantage over a band saw for sawing second-hand lumber, for while it uses up more of the timber in sawdust, the expense for saw sharpening and renewals is very much less.

The importance of ordering lumber in the smallest size that can be used has been impressed on everyone as well as the need of stating on a requisition, the purpose for which it is to be used. Lumber can be cut into smaller sizes, but not into larger ones. Formerly it was the practice to order lumber in long lengths, and then cut it up in multiples, i. e., order 12-ft. pieces and then cut them up into 4-ft. or 6-ft. lengths. By ordering the short lengths (4-ft. or 6-ft.) short sticks can be used which would otherwise be wasted. Even if the short lengths ordered have to be cut from longer lengths, this can be done on a power cut-off saw for one-tenth of the cost of cutting by hand. It is far cheaper to cut lumber at the mill than in the field.

Practically all stock yards can be made from second-hand lumber. Posts can be made from second-hand switch ties, which should be treated. Slats can be cut from second-hand bridge timbers. Pile butts are sawed into fence posts, crossing plank, buffer blocks and other car and building material. Old poles are cut into fence posts and many of them into the longer lengths of posts that cost 80 cents to $1.25 each new, thus making a large saving. Over 9,000,000 tie plugs are made each year from mill waste.

To get the most out of the reclaiming of lumber, it is necessary to educate the user constantly as to its possibilities. Everyone must co-operate in getting the second-hand lumber to the resaw without any delay so it will be available for use. It is necessary to have an efficient resaw plant, and a man in charge capable of sorting and resawing the wood properly.

*This paper was received subsequent to the closing of the contest, but is included here because of its direct application.

EFFECT OF WATER ON CONCRETE

BY DUFF A. ABRAMS,
Professor in Charge, Structural Materials Research Laboratory, Lewis Institute, Chicago

WATER is one of the essential ingredients in a concrete mixture. A certain quantity of water is necessary for the chemical reactions of the cement; a certain additional quantity is generally required for the purpose of producing a plastic mass which can be molded into any desired form.

There are a great many differences of opinion among engineers and contractors as to the influence on the

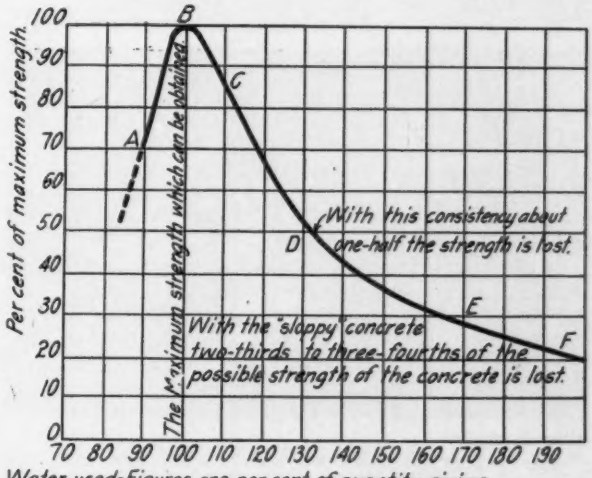


DIAGRAM OF TEST RESULTS

strength and other properties of concrete as the result of differences in the quantity of mixing water used. A thorough experimental investigation of this subject is under way in the Structural Materials Research Laboratory. The diagram summarizes the results of compression tests on 6-in. by 12-in. concrete cylinders made in mixes ranging from 1 part cement and 9 parts aggregate, to 1 part cement and 2 parts aggregate, by volume. These mixes represent concretes of all qualities from the leanest to the richest which are generally used for any purpose. The aggregate consisted of a mixture of sand and pebbles graded in size from the finest particles

up to 1¼ in.; the same grading was used in all cases.

These tests show that the effect of proportional changes in the mixing water is approximately the same for all mixes of concrete; consequently a composite curve has been drawn to show the average effect. The vertical distances represent the relative strength of concrete, expresed as a per cent of the maximum which can be secured from a given amount of cement and the same aggregates. The horizontal distances indicate the relative quantity of water used in the mix, considering the amount which gives the maximum strength as 100 per cent.

The amount of water which gives the maximum strength in concrete produces a mix which is too stiff for most purposes. It will be noted that the concrete strength increases rapidly with the quantity of water over the range indicated by A-B on the diagram. With any further increase in the amount of water there is a rapid falling off in strength, as indicated by the curve BCDEF. With an amount of water about double that required for highest strength, the concrete has only about 20 per cent of the maximum strength.

The exact amount of water corresponding to the maximum strength of concrete will vary with the method of handling and placing the concrete. Any method which involves puddling, tamping, rolling or vibration, or the exertion of pressure in any manner, will have a tendency to increase the strength of the concrete regardless of the amount of water used. However, it is probable that the effect produced by these methods will be more pronounced in the consistencies in the vicinity of the maximum strength.

Few engineers or contractors realize the disastrous effects which are certain to accompany the use of too much mixing water. Many reason as follows:

1. The excess water does no harm because it runs off and evaporates.
2. While very wet concrete is weak at early ages it gains in strength more rapidly than the drier mixes.
3. The rich mixes used in average work are less affected by excess water.

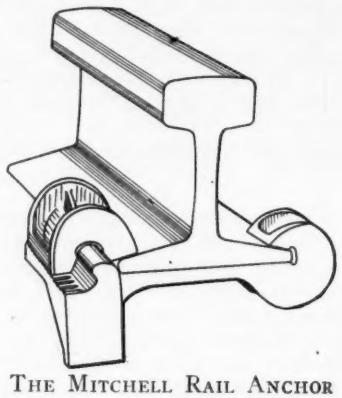
The experimental work carried out in this laboratory and elsewhere show that none of these conclusions is correct. The use of excess water produces a concrete which is inferior for all mixes and at all ages. The tests also show that the excess water does not run off until consistencies are reached which correspond to those indicated in the region E-F and beyond. This is indicated by the flattening of the curve which shows that the addition of water beyond that indicated by F has little effect. At this point a degree of "sloppiness" is reached which gives only about 25 per cent of the available strength.

The proper quantity of water will vary with the quantity of cement and the size and grading of the aggregate, and to a less degree on the nature of the aggregate. The water required for a sand and crushed stone aggregate is not appreciably different from that required of a sand and pebble mixture, providing the grading of the aggregates is similar. In case of very soft or porous aggregates a somewhat greater quantity of water will be necessary.

The quantity of water required will depend to a minor degree on such factors as the type of concrete mixer, method of placing the concrete, method of finishing, temperature, etc. There is no direct criterion for determining in advance the best quantity of water for concrete. The principal difficulty in the way of attempting to determine in advance the proper quantity of water results from the variation of the moisture in aggregates.—*The Portland Cement Association.*

AN ADJUSTABLE RAIL ANCHOR

THE Mitchell Rail Anchor Company, Louisville, Ky., has introduced a new anti-creeper with an adjustment of wide range that is designed to insure a perfect fit on rails of various widths and thickness. It is made in two parts as shown in the drawing. The body portion goes under the rail with a grip on one side to take hold of the rail flange and a rib on the other side. The



THE MITCHELL RAIL ANCHOR

other piece is a locking jaw to go over the rib on the body portion. The adjustment is secured by the position of the locking jaw on the rib, since the latter is placed at a decided pitch relative to the plane of the under side of the rail and also at an angle with the edge of the rail base. Therefore, when being driven into place the locking jaw is carried downward to contact with the top of the rail base, and at the same time inwardly towards the rail. This feature makes it practical for the anchor to fit two or more sections of rail.

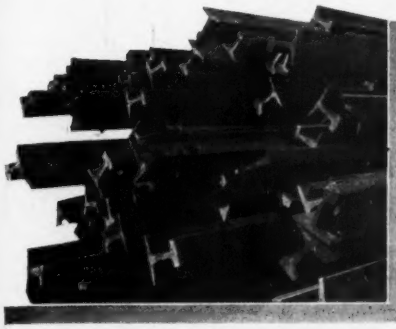
The anchor is a driving fit when applied at right angles with the base of rail and in its application it is

THE ANCHOR AS USED IN TRACK

locked automatically. It has no loose or neutral position, either in the forward or back-up movement of the rail. As a result, it resists the creeping of the rail in either direction when frozen in the ballast. The lock is located on top of the rail, free from contact with the ballast, thereby avoiding failures due to pounding in the ballast.

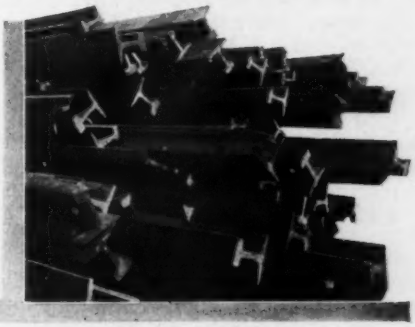
The anchors have been in use for some time on the St. Louis & San Francisco, the Kentucky & Indiana Terminal, the Big Four, the Grand Trunk and the Santa Fe.

RECLAIMING BATTERED AND WORN RAILS



Methods Followed by One Road to Return This Material to Use

BY JOHN REINEHR,
Foreman, Rail Saw Mill, C. M. & St. P., Savanna, Ill.



A CERTAIN percentage of rails (depending upon the care and skill exercised in their manufacture) will develop defects during their early service period which were not apparent to the inspector who accepted them. These defects may take the form of broken flanges, transverse breaks through the body of the rail (not infrequently through the bolt holes), badly battered rail ends, pipes or splits. During this early part of their service such rails are individually removed from the track and replaced with other new rails. The rails so removed, unless covered by a manufacturer's guarantee, have only a scrap value unless means of reclamation are available to refit them for further service in the track.

In the present state of the art of track maintenance, all of the rails in main line service will ordinarily develop defects from service which necessitate their removal and replacement in the course of from 8 to 14 years. These defects usually are battered ends and worn fishings and, in the case of curved track, flange-worn heads on the outside rails and crushed heads on the inside rails. Some of the rails after this period of service are still fit for service in secondary main tracks or will sell as relayers in the market; some are fit only for side tracks and others will have to be sold for scrap. The best of the rails after this period of service will not make first-class track without measures to improve their condition.

It is the writer's opinion (based upon observation, but not a matter of record) that after this service period at least 10 per cent of the rails will be found in such condition as to be unfit for further service unless some work is done on them, and that 90 per cent may be reused or sold for relayers in the condition released from track, but will give inferior track.

The methods of realizing the salvage from rails removed from the track are about as follows: (1) To sell for relayers directly at current prices all the rails that will pass inspection, and for scrap those that will not pass inspection, realizing on them in cash and possibly saving some transportation cost. (2) To sort the rails for condition, the better portion to be used in minor main tracks, a portion in side tracks and the balance to be sold for scrap. The best of the rails will make inferior track because of bad rail ends. (3) To reclaim the rails as a whole, with a view to getting all of the service that may be in them, expecting to be reimbursed for the cost of reclaiming by this additional service.

There are two methods of reclaiming rails quite generally recognized as being efficient. One is to heat and reroll them, reducing the section and theoretically producing a new rail of the original length but of a lighter section. The other is to assemble the rails at a centrally located point for inspection, classification, straightening, cropping worn ends and reboring for splice bars.

From the writer's observation the process of rerolling rails after a service period is successful in that it prolongs their ultimate life over that of simply cropping battered and worn ends. It conserves the original lengths and produces well-appearing and well-wearing rails from old rails off tangent track, or light curves, normally worn during a service period, the battered ends and worn fishing being rolled out, and the rails cropped. The process, of course, is much more costly than simply cropping the ends at a home plant and unless the rerolling plant is in fairly close proximity to the road owning the rails, the cost is prohibitive.

The desired effect of any method is to get the largest possible return from the rails recovered, either in money or in service, which latter ultimately means

SAW TABLE AND SKIDWAYS

money, but the value of which in money cannot, for want of data, be so defined in all cases. The gain in the reclamation of rails consists in: (1) Rails recovered from scrap (the difference between their scrap and serviceable value). (2) Serviceable rails with the worn ends cropped, thereby reducing the cost of maintenance. (3) Increasing the life of joint ties and ballast. (4) Reducing wear on power and rolling stock. (5) Making smooth, comfortable riding track. The value of relaying rails is assumed to be $22 per ton and the value of scrap $13, which values are conservative, based upon the near past, and eliminating the immediate past with its more or less inflated values.

The reduction in cost of maintenance results from the decrease in the number of times the track joints with perfect rail ends need surfacing as compared with track

joints with battered and worn rail ends. The value of the increased life of joint ties is the same percentage of the cost of the ties as the percentage of increased life. The gain secured through these items can be expressed in money, while the gain from the other two cannot be so expressed. At the plant under the writer's jurisdiction the cost per ton for reclaiming rails during 1915 was $0.49. This cost in a plant not so well equipped will perhaps be more.

As a definite demonstration of the savings accomplished, the following figures are taken from the 1915 records of the C. M. & St. P. plant at Savanna, Ill., operated under the writer's jurisdiction:

STATEMENT OF WORK PERFORMED AND EXPENSE OF OPERATION FOR THE YEAR ENDING DECEMBER 31, 1915

No. Tons Sawable Rails Sawed	Realized from Rails Sawed—in Tons					No. Angle Bars Reclaimed	No. Tie Plates Reclaimed
	Main Track Rails	Second Quality Rails	Side Track Rails	Rails for Frogs	Scrap Rails		
17,612	8,320	2,778	3,202	365	1,047	40,360	114,763

Kind of Material	Tons Material Received	Tons Material Shipped	Cost of Operation and Maintenance	
Sawable and usable steel rails	32,851	25,006	Interest on cost of plant estimated at $45,000 at 5%	$2,250.00
Steel rails to reroll		4,204	Pay Roll	22,003.27
New steel rails	1,556	5,297	Expense for supplies, fuel, etc	4,026.02
Scrap steel rails	11,361	11,207		
Scrap iron rails	859	1,005		
New joint fastenings	715	860		
Usable second-hand fastenings	5,289	1,912		
Scrap fastenings		2,399		
Usable tie plates		703		
Scrap tie plates		527		
Total tonnage handled	52,641	53,120	Total operating expense	$28,279.29

In the operations of this plant there were reclaimed from scrap condition 2,445 tons of rails included above, 2,080 tons of which went for ordinary track service and 365 tons for the manufacture of frogs.

The reclaiming of the angle bars consisted in cutting 12 in. from the end of a 37-in. or 40-in. angle bar, thereby changing the center, and repunching and reslotting the bar, improving its condition, and salvaging 201 tons of scrap angle bars worth $10 per ton. Two hundred thirty-four tons of tie plates were reclaimed from scrap by straightening or by shearing and repunching obsolete plates, making them fit for further service. The salvage value was estimated at $14 per ton. Estimating the salvage value of serviceable rails recovered from scrap at $9 per ton, the salvage value of tie plates so recovered at $14 and the scrap value of scrap angle bars recovered at $10; the operation of this plant shows a clear demonstrable gain as follows:

Salvage value of 2,445 tons recovered from scrap at $9	$22,005
Salvage value of 201 tons scrap angle bar at $10	2,010
Salvage value of 234 tons tie plates recovered from scrap at $14	3,276
Demonstrable salvage	$27,291

This salvage value (from approximately 6 per cent of the whole tonnage handled) set against the whole operating cost leaves a balance of operating cost of $988.29, which to all intents and purposes has paid for the following performance:

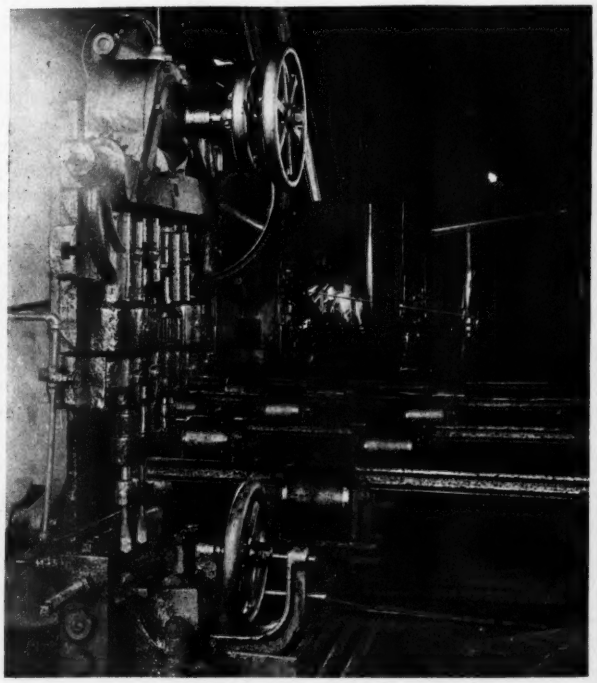
The improvement in condition of 14,120 tons of rails from an inferior condition by straightening and sawing.
The handling of 11,035 tons of serviceable rails not sawed.
The handling of 4,204 tons of rails reshipped for rerolling.
The handling of 1,566 tons of new rails.
The handling of 12,240 tons of scrap rails.
The handling of 4,349 tons of joint fastenings and tie plates.

The plant that has accomplished the above results consists of a yard about 12 acres in area with tracks, track scales, skidways for storing rails, overhead tracks on which are mounted air hoists for unloading, sorting and reloading the rails, and a reclaiming plant consisting of steam power, hydraulic press, straightening machine, two friction saws, pneumatic chipping hammers, two double head drill presses and a splice-bar shearing and punching machine.

When received off the line the rails are weighed on the track scales and, and as a rule, are sorted in a preliminary way when unloaded for section and condition, using the air hoists for this purpose. They are sorted to the following classification:

Rails fit for relaying without sawing.
Rails fit for rerolling.
Rails to be sawed.
Scrap rails.

Rails which show no appreciable wear, or rails too much worn to be used for any but side track purposes,



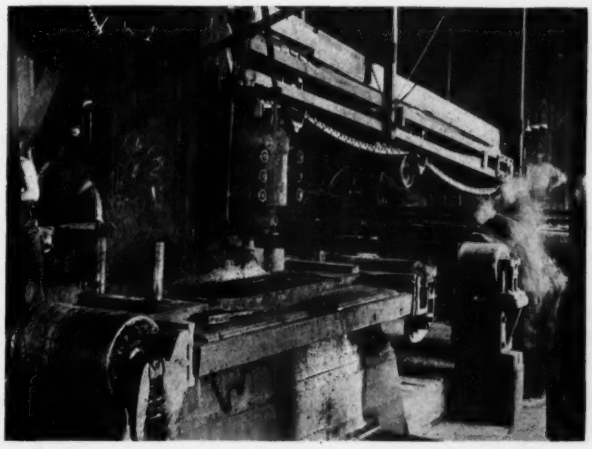
DRILL PRESSES AND SKIDWAYS

and which may have good ends, and need no sawing for the use intended, are piled in a class by themselves. The rails fit for main track service are placed in one separate pile, and the rails fit only for side track service in another. Rails of 85-lb. section or heavier showing only normal wear, with battered ends or worn fishing, are classed as rails for rerolling, are put into stock piles for reshipment to the rerolling mill or are directly transferred to other cars for the same purpose. All rails not enumerated above, if fit for any service after being

straightened and sawed, are either unloaded directly onto a skidway leading into the reclaiming plant or on adjacent skidways from which they can be readily moved into the plant. The last classification describes all rails not fit for any service. They are piled subject to sale by the purchasing department.

RECLAIMING OPERATIONS

Rails passing through the reclaiming plant for resawing are pulled broadside onto the straightening machine



STRAIGHTENING MACHINE

(a home-made hydraulic press) by a rope and a belt-drive drum handling from 8 to 20 rails at one time. Two men are assigned to this machine, their duties being to keep the rails close to the straightening machine, and to remove the sawed crop ends from the building by means of a push car running on a track leading from the building. The rails then pass through the straightening machine under the hydraulic ram, and are straightened while supported on two bolsters spaced five feet apart. Either line or surface bends can be straightened. This machine is manned by a straightener and two helpers. After straightening, the rails are pulled broadside onto the saw table or carriage by means of a horizontal air hoist manipulated by the straightener.

Arriving at the saw table the rail is inspected by two of the three sawyers who classify it into one of the following grades:

For rails of 85-lb. section or heavier
- Main track rails
- No. 1 second quality
- Second quality
- No. 1 Side track
- Side track
- Curve worn main track

For rails of less than 85-lb. section
- Main track
- Second quality
- Side track

They indicate on the base of the rail by a suitable chalk mark whatever grade the rail will qualify for. They also determine where the rail should be sawed for a good end. They then drop the rail broadside on to the saw table on its side with the head toward the saws and spot it endwise to suit the defective ends. The chief sawyer than clamps the rail to the table with a pneumatic clamp and feeds the table to the saws with a pneumatic feed, cutting through the rail in from 12 to 20 sec., depending on the section. After the rail is sawed the table is returned to the original position, the clamp raised and the rail run endwise by means of belt-driven live rollers on the saw table, manipulated by the third or chief sawyer, until it clears the saws. It is then pulled off the saw table broadside by the two chippers (one at each end of the rail).

After removing the rail from the saw table, the chippers remove the fins or burrs raised by the saws and pass it broadside on to the drills, four of which are in service (two at each end) manned by four men and placed in a staggered position so that four rail ends are drilled at one time, each man and each machine drilling each alternate end.

The men thus far enumerated handle their own rails to and from the machines, helping one another when sawing rails up to 90-lb. section. When sawing heavier rails it has been found expedient to give the two chippers one helper and the four drillers two helpers, thus adding three men to the crew.

Before the rails pass out of the mill to the sawed stock piles a man applies a template to the head of each rail marked by the sawyers as a main track or second quality rail to classify them according to depth or thickness in variations of 1/32 in. each, marking the base of the rail No. 1, 2, 3 or 4, as the template may indicate. The rollers leading out of the mill are manned by 4 men who distribute the rails and pile them in stock piles, or load them on cars direct, as desired. The rails are piled or loaded with air hoists mounted on overhead rails spanning the centers of and running the full length of the skidways.

Sorting the rails for condition and uniform thickness of head is of much value in obtaining good track results and economy in maintenance cost. The rails classed as sawed main track rails are calipered for thickness of head and make as good track joints as new rails if new

YARD FOR SAWED RAILS

or unworn joint fastenings are applied. The rails classed as second quality rails are as safe as main track rails. They are more or less worn, but will give good service in branch line main track. The ends will match up to an even surface as the heads are calipered the same as the heads of the main track rails.

The rails classed as main track, curve worn rails are outside curve rails, with the head worn not to exceed 7/16 in. at the top of the rail. The ends are sawed and the heads calipered the same as the other main track

rails. They make good track joints and give satisfactory service in branch line main tracks. Side track rails are for side track purposes only. Rails for switch and frog purposes are cut from pieces too short for other track service, but otherwise in good condition. They are sawed to suitable length for the definite purpose and are shipped to the company frog shop.

The judicious sorting of angle bars and rail joints produces many joints in good condition for reuse, although, as a general thing, angle bars and joints are badly worn when removed from track and should not be reused on rails classed as sawed main track rails. There is at present no practical method known to the writer for filling out the worn centers of angle bars and rail joints. The long angle bar may be cropped on one end, thereby shifting the worn portion from the rail ends, but it is not as good as a new angle bar and should not be used extensively on sawed main track rails.

The assembling of tie plates removed from track gives an opportunity to sort them for section and condition, to straighten slightly bent plates and to refit obsolete plates for further service. The same holds good in rail anchors, for while the greater number of these are broken and distorted, more than enough serviceable anchors can be sorted out to pay for the sorting.

The organization at this plant consists of the following for a full crew:

1 General foreman
1 Yard foreman, assistant to the general foreman
1 Assistant yard foreman in charge of joint fastenings
1 Clerk
1 Engineer
1 Fireman
1 Night watchman
1 Straightener
2 Straightener helpers
3 Sawyers
2 Chippers
4 Drillers
2 Laborers pulling rails to the straightening machine and removing crop ends
5 Laborers taking rails to the plant. (This is reduced to three when unloading into the plant off flat cars or gondolas.)
5 Laborers taking the sawed rails from the mill and either loading direct onto cars or piling in stock piles.
3 Men to be added in case of sawed rails of 90-lb. section or heavier

The above crew will operate the reclaiming plant to its maximum with an output of from 150 to 200 tons per day, depending upon the rail section and the length of rails. The crew can be reduced in various stages and the plan operated with a smaller output if conditions make this expedient. To the above, when operating with a full crew, must be added a sufficient number of laborers to handle the material not passing through the rail reclaiming plant such as relaying new or scrap rails, fastenings and tie plates, the number varying with varying conditions of business.

The Duties of a Crossing Watchman

BY W. F. RENCH,
Supervisor, Pennsylvania Railroad, Perryville, Md.

INCREASED attention is now being given the matter of providing uniform and effective protection for grade crossings. The subject has become a very live one not only by reason of the almost universal use of the highways by automobiles, but also because of the natural expansion in population. Much study and thought have been devoted by the higher officers to the physical requirements of crossings. It has been determined that the cross-arms type of warning sign is the best; that these should be supplemented with cautionary signs at least 300 ft. from the crossings; that gates should be painted in alternate diagonal stripes of black and white; that the grades leading to the crossing should be made as easy as possible, and that especial attention should be given to enlarging the view both of the crossing from the engine and of the train from the approaches of the crossing. The man element in the protection is more directly the concern of the maintenance-of-way department. While the rules on many roads place the crossing watchman in charge of the captain of police he is practically everywhere under the supervisor's responsibility.

Crossing watchmen are almost invariably recruited from the track forces, the character of which has undergone a radical change in the last few years, and many crossing watchmen are therefore of necessity foreigners. It is, of course, essential that they should in all cases be able to speak English, at least so as to be understood, and they should be able to write it also. The selection, training and observation of these employees is thus a most important duty of both the supervisor and the foreman. A set of rules to be posted in the watch house, which have been adopted as the elemental practice in crossing protection, is reprinted below and forms the basis of this discussion.

SPECIAL INSTRUCTION FOR CROSSING WATCHMEN

1. The crossing watchman must understand that his first and most important duty is the saving of human life.
2. The hours of duty at this crossing for week days are from —— a. m. to —— p. m., and from —— p. m. to —— a. m., or for week days from —— a. m. until after the passage of Train No. —, unless more than — minutes late. On Sunday from —— a. m. until —— p. m., and from —— p. m. to —— a. m.
3. When two or more watchmen are employed during the day or night there must always be one on duty. When both day and night watchmen are employed, they must not leave their posts until relieved.
4. The crossing watchman reports to and receives his instructions from the supervisor.
5. He must provide himself with the proper appliances for giving signals, keep them in good condition, understand their use, and must have with him while on duty copies of the current timetables, and supplements, if there are any.
6. He must not permit unauthorized persons in or about the premises, must not read papers or books while on duty, nor unnecessarily engage persons in conversation. He must keep his watch house and surroundings clean, and the crossings and footwalks clear of dirt, snow and ice. This work must be done at such times as not to interfere with his duties as watchman.
7. He must, as far as possible, prevent persons from trespassing on the company's property.
8. He must exercise care to insure full protection at the crossing when trains are approaching.
9. He must, in case of accident to vehicles or pedestrians on the crossing, or vehicles colliding with and damaging the gates, secure the names and addresses of parties to the accident, together with names and addresses of witnesses, and in all cases immediately report by wire to the superintendent.
10. He must, whenever the driver of an automobile crosses at reckless speed or fails to heed a warning and thereby incurs an improper risk, accurately note the license number of the automobile and report fully the circumstances of the case.

11. He must, when trains block crossings in such manner as to interfere unnecessarily with their use by the public, notify trainmen to cut the train and clear the crossing. In case of refusal of the trainmen to do so, he must make a report giving the number of the engine or train.
12. A copy of these instructions must be posted in each watch house. SUPERINTENDENT.

Observation may well be made frequently to determine that these rules are properly posted and that the hours of the watchmen are correctly shown. In the event of an accident occurring while protection was suspended, a copy of the instructions would supply valid evidence for the company's defense. A sign should be similarly posted outside the watch box giving notice to the public of the hours during which the crossing is not protected. This advice is necessary in order that the traveler may know that at such times his safety is entirely in his own hands. In all cases wherein report is made of automobiles infringing safety rules a letter should be sent by the superintended to the owner of the machine calling his attention to the matter.

The proper selection of men to fill the positions of crossing watchmen requires care not only on the part of the supervisor, but also of the medical and transportation departments. It is the supervisor's business to examine into the man's intelligence, to inquire diligently as to his general health and his mode of living, especially as regards sobriety, and to estimate his probable loyalty to duty. The medical department examines him as to his eyesight and hearing, and the transportation department as to his knowledge of such of the rules as he will need to use. The approval of all of these should be essential to appointment. Equal care should be used in the selection of relief men to fill the places of the regular men upon their assigned days of absence.

In the training of watchmen to a full knowledge of their duties and responsibilities, the important points to be taught them are: First, that gates should be lowered in sufficient time before the arrival of a train and kept down until it has passed and until it is found that no other train is approaching; second, that in flagging a crossing where there are no gates it is generally best for the flagman to stand on the farther side of the railroad from that upon which the train is coming, as he can thus intercept travelers who might overlook a more distant train approaching from the opposite direction; third, that he should observe those who are waiting to cross and give particular attention to any that seem to be careless or unmindful of danger; fourth, that children should be especially safeguarded.

There is a wide difference of opinion as to whether the watchman should give proceed signals to the traveler on the highway. When the hand disc, bearing the word STOP, is used in place of the flag, it would seem that its withdrawal should generally be sufficient notice to come ahead. With the flag, however, it is hardly possible to move the traffic expeditiously unless the furling of the flag is accompanied by a signal in the hand. It is believed that the matter is one where no fixed rule is desirable and where the judgment of the man should be the best guide.

The watchman should be directed to pass the traffic on the highway promptly so that his crossing may not become congested. To this end the gates should not be lowered unnecessarily long before the arrival of the train, nor should they be kept down after the way is found to be clear.

The crossing flagman may be called upon to flag a train through an automobile stalling upon the track, an animal getting fast in the crossing flangeways, or some similar trouble. He should have his red flags and his red lanterns in such a place that he can make use of them instantly. The red lantern should be kept lighted throughout the night. When it is necessary for him to leave his post to flag a train he should, if possible, get a responsible bystander to assume his place at the crossing. If both tracks are endangered suddenly he should ask a bystander to assist him in flagging trains.

While it is of the greatest importance that the exact program of protection established for the crossing shall be carefully observed, the supervisor should have full authority to place additional protection when required by an unusual traffic of temporary duration, or similarly to place a watchman when the protection would normally be withdrawn. The crossing watchman should never be late at his post and he should close the watch box when the specified hour for withdrawing has arrived. When there is continuous protection he should not depart until the other flagman is on hand to relieve him. He should not leave his crossing during the hours of protection unless the trackwalker or some other reliable person is at hand to supply his place while he is absent.

The rule prohibiting loitering about the watch box is one that must be observed. Idle persons distract the attention of the watchman and of travelers about to use the crossing. The flagman should call the attention of loiterers to this regulation and require them to heed it. To forestall the need of such action, a sign should be placed in a conspicuous place upon the watch box reading "Loitering Prohibited." The use of the word *loafing* is objectionable, because it does not convey the intended meaning, and it tends to create a hostile spirit. One of the essential requirements in a good watchman is to be able to cultivate friendly, but not familiar, relations with the people who use his crossing daily.

The important duties that devolve upon a crossing flagman when an accident occurs are to protect trains, aid the injured as far as he can, procure full information and communicate it to the foreman as quickly as possible. Even where no apparent injury has resulted it is necessary that reports be made of all occurrences which might constitute an accident case. He should note especially whether or not the headlight was burning and engine bell was being rung, and what other warning was given by the train.

Since the failure of a crossing watchman might entail serious results, many observations are made to assure proper performance. Each watchman should be tested periodically as to his detailed method of protecting. This can best be done by a surreptitious visit to the locality. At such times it should be noted whether the appliances for flagging or for conveying stop signals are in order. Tests may also be made to assure that the hours of protection are properly arranged, and observed. Each watchman should be tested at least once every month, and a careful record kept of the tests.

A NEW BOOK OF RULES

THE Baltimore & Ohio has issued a new book of rules for the guidance of employees in the maintenance of way department, which is unusually complete for a book of this character, especially in regard to methods of conducting the more or less difficult problems encountered in this branch of railway operation. The book contains 205 pages and includes 794 rules in addition to a 35-page appendix with drawings of standard turnouts, bills of material and tables of use in maintenance of way work. In addition to the instructions for the handling of track and other maintenance work, 24 pages are devoted to methods of rendering first aid to the injured with numerous illustrations of the proper way of taking care of injuries. The book covers all the problems commonly

encountered in the maintenance of track, bridges, buildings, telegraph lines, water stations and signals.

The following rules taken from this book show some of the practices employed on this road and are of special interest, as they are not ordinarily found in books of this character:

Work that may interfere with the safe passage of trains at full speed must not, except in cases of emergency, be done during fog or storm.

When large numbers of inexperienced men are working on the track, they should be divided into small squads, each squad placed in charge of an experienced man, and all necessary additional precautions taken to prevent accidents.

The annual renewal of cross-ties and switch-ties shall be determined by an inspection to be made as soon after the first of the year as weather conditions will permit, and completed prior to the first of July. The inspection shall be made by the supervisors, or an inspector appointed for that purpose. The selection of ties to be renewed must be made by careful inspection of each tie in the track, taking into consideration the local roadbed conditions, the condition of the ties on either side of the one under inspection, the amount and character of the traffic and the alinement of track. Except in an emergency, no ties other than those broken or marked for renewal shall be renewed.

Ballast should never be applied where it will probably be necessary to renew the rail in the course of two or three years, unless it becomes absolutely necessary to use small quantities for patching. Ballast should be applied where needed at the time new rail is laid, in order to facilitate the work of respacing ties and at the same time take the best possible care of the new rail. By studying the relative conditions of the rail and the ballast, and arranging the rail and ballast programs to coincide, a saving in the cost of maintenance is secured and the track is less frequently disturbed, thereby producing better track at less expense.

Track should not be raised on gravel ballast more than six inches in any one year, as too long a time is required for the ballast to become thoroughly compact where heavy raises are made. The same is true of engine cinders and similar materials.

Always work against the current of traffic, except on heavy grades, where it is desirable to work up grade. At the biginning of a raise, make a runoff of 30 ft. for each one-inch raise where the scheduled speed of trains is 40 miles per hour and over, and 20 ft. for each one-inch raise where the scheduled speed is less than 40 miles per hour.

Reference is also made to methods for the removing of earth from cuts, in which it is specified that a steam ditcher is undesirable when less than 35 per cent of the time is spent actually ditching, except where it is necessary to expedite the work. Wheelbarrows can be employed economically where the haul does not exceed 500 ft., while the same condition also favors the economical use of teams and scrapers.

The following rules are given for the determination of the speed of trains when standing on the ground beside the passing train: with coal trains the number of cars passing any point in 24 seconds equals the approximate speed in miles per hour, while with mixed freight trains the speed is equal to the number of cars passing in 28 seconds.

Advertising To Secure Track Laborers

BY WILLIAM S. WOLLNER,
Assistant to Chief Engineer, Northwestern Pacific, San Francisco, Cal.

IN the issue of the Railway Age Gazette for March 15, 1912, there appeared an article entitled "Plan of Organization for a Railway Track Labor Department," briefly describing a plan proposed by the author for securing a better class of track labor and for obtaining greater efficiency from track labor forces. On August 31, 1914, the author presented to the United States Industrial Relations Commission, at their request, a report of proposed plans and a record of the successful operation of company-conducted employment bureaus and labor departments, which was shortly after published as a part of the report of the commission.

This publicity has brought to the author's desk many letters from railroad officials and others asking for further details of what some of them term the "Wollner Plan," and as many communications have appeared in the Railway Age Gazette and the *Railway Maintenance Engineer* recently on the subject of the difficulty of securing and keeping adequate track labor forces and obtaining from them efficient results, it seems timely that this subject be further enlarged upon.

The so-called "Wollner Plan" has for its basis three principal elements: (1) the careful selection of men fitted to the peculiar requirements of track work; (2) the proper supervision of the work performed by track forces; (3) the education, where needed, of foremen and laborers to a standard of efficiency previously determined upon. There are many other less important elements included in the plan, such as the promotion of qualified men to foreman; training men from outside the service for foremen; social service work among men and their families, etc. As the important question at the present time is the securing of an adequate track maintenance force this article will deal principally with that phase of the question.

The shortage of track labor (other than the usual shortage that has always existed in some degree) may be traced to three sources: (1) the returning of men who usually find employment in railroad work to their homes in Europe; (2) the stopping by the European war of the usual influx of immigration; (3) the obtaining of more lucrative employment in munition factories of men who are usually engaged in track work. In other words, the railroads have lost some of their men and the opportunity to recruit new forces through the same cause, the European war. This being a fact, there is only one way to obtain and keep needed track forces; make track work more attractive to desirable men. One way in which this may be done is by increasing wages; another way is by making the period of employment constant and the working conditions better.

When business is dull a merchant will advertise his wares to increase his sales and in advertising will present in their most attractive form the goods he wishes to dispose of. With this in mind, when all other sources failed to produce the needed number of men for the season's work the author took recourse to the advertising columns of the local newspapers with surprisingly successful results. Before advertising, however, no source that should produce men was left untried; this meant that private employment offices, the state public employment office, federal employment bureau, state immigration bureau, United States Immigration Service, charitable institutions, etc., were investigated as possible producers of men. Each of these sources produced some men, but they did not together bring enough to fill vacancies in

extra and section gangs. It should be understood that, at the commencement of the season, surrounding roads increased the pay of their section laborers from $1.75 to $2 and of their extra gang men from the same rate up to $2.40, but that the road for which the men were needed continued its $1.75 rate throughout the entire season for section men and nearly through the season for extra gangs. As a matter of fact, the only increase was to $2 for a steel-laying gang and for a ballasting gang, other outfits still continuing at the $1.75 rate.

It was realized that the usual advertisement, haphazardly written, would not get the men, so, although inexperienced in ad-writing, the author undertook to produce something different from the usual "copy." The first advertisement was defective in its wording (it having been decided just as the paper was going to press to try it out), but it nevertheless produced some results. Its principal defect was that it failed to state that the employment offered was in railroad track work.

TAKE a vacation without expense at the beautiful summer resorts on Russian River; no railroad fare to pay. You can obtain work at $1.75 per ten-hour day and have the balance of the time to enjoy yourself in the famous climate and wonderful scenery of Marin, Sonoma, Mendocino counties. Apply room 909, Phelan bldg., at once for full particulars.

This advertisement appeared July 29, 1916, and that day over 40 men applied for work as a direct result. Of these only 5 were employed, the balance being rejected or refusing employment when told the class of work offered.

WANTED, for railroad section gangs, laborers who are willing to work for $1.75 per day while learning to be foremen; section foremen are in great demand in all parts of the country and are paid a minimum of $90 per month and given house rent, water, light and fuel free; any ambitious man who can do laborer's work can in a short time qualify for job as foreman and earn big wages; absolutely no expense to applicant; free transportation to job; no office fee. Call early, Monday and Tuesday, at room 909 Phelan bldg., for further particulars.

The above advertisement appeared the following day and over 20 men responded, 9 of whom were employed. It will be noted that the appeal in this advertisement is to men who desire to work into foremen's positions. It was found that many of the men responding had worked at some time as section laborers, but had given up that line of work owing to their belief that promotion was impossible. The response to this appeal decided the author to attempt to reach a certain type of individual in each ad that followed, and it was found that as far as this experiment could show this was the proper solution of the difficult situation.

FREE transportation to any point in California after one year's service, any Pacific Coast point after two years' service, to any point west of Chicago after five years; hospital and medical treatment; pension for thirty years' service; section laborers wanted by railroad company, to work for $1.75 per day, with chance for promotion to foremen for first-class men; no office fee; free transportation to job. Call room 909, Phelan bldg., for further particulars.

There are always working men in a community who have a great desire to travel, but who do not wish to become hoboes. In other words, they desire to travel "on the cushions," and the above advertisement showed that men were willing to leave other employment in order to earn transportation privileges. Some of the applicants spoke quite assuredly of the trips they were going to take after completing the necessary length of service.

Probably every one of us who has not made a "stake" is constantly worrying about what will happen to him in case of sickness, or how he will support himself during old age. The United States makes a strong appeal to recruits for the army and navy in its efficient medical service and pension system, and this was taken as the leading thought in the advertisement that follows:

MR. LABORER, does your employer give you a pension when you are old; does he give you hospital and medical treatment when you are sick; does he give you free trips to different parts of the United States when you go on your vacations? Section laborers on railroads get all these things and more. Steady employment the year around at $1.75 per day. No office fee. Free transportation. Call room 909, Phelan bldg., for further particulars.

The next advertisement was a combination of those that preceded it and drew very good results. It appealed particularly to men who had worked for many years at different kinds of labor work, and who thought that by accepting employment on the sections they could realize their one-time ambition to rise above their fellow-workers.

MR. LABORER—Is your present job training you to be a foreman? Good men, with experience as section laborers, can get jobs as section foremen in all parts of the country at high wages. Earn while learning without any cost to you. Section laborers are needed by railroad willing to pay $1.75 per day and give medical and hospital treatment, pensions, free trips over all railroads, etc. No office fee. Free transportation to job. Call 909 Phelan bldg., for further particulars.

The sixth advertisement inserted in this series was an attempt to ascertain whether the securing of a congenial home would appeal to the man who had been wandering around the country with no place that he could call home, and it was found that there were many men to whom the thought of being accepted into the family life of the foreman appealed very strongly.

SECTION LABORERS—Section foreman at Cain Rock, Humboldt County, wishes 8 congenial laborers to work on his section and board in pleasant surroundings with himself and family; good bunkhouse to live in; wages $1.75 per day; free transportation; no office fee. Call for further information at room 909, Phelan bldg.

Considering that surrounding roads were paying from 25 to 65 cents more than this road, that it was able to keep its gangs reasonably full, and that advertising for men played a large part in the program of employment, it is safe to say that this class of advertising is well worth trying when roads are hard pressed for men. The true lesson of this experience is not, however, in the advertising feature alone; the moral of the story is that if you want men and must have them, and at the same time cannot afford to pay higher (or as high) wages as surrounding roads and industries, the way to get them is by bringing to their attention the advantages that section and extra gang work offers.

Of course, honesty demands that you fulfill your promises after making them and give the men a chance to earn promotion, steady employment, etc. But this has to do more with the keeping of men than the employing of them, and there are very few roads in these days of limited labor supply who do not realize the need for contented men, well housed and fed, with the prospect of promotion as a reward for good work.

As to the cash value of keeping wages at a given figure. During the year just passed the road upon which this experiment was used there was upward of 160,000 man-days devoted to section work at a cost of about $280,000. An increase of 25 cents per day would have meant over $40,000, or an increase in this one item of about 14 per cent. This is, however, but one phase of the situation. Without sufficient men the road would have deteriorated into a condition where the cost of bringing it again to standard would have been much more than the cost of keeping it up to standard, while the risk of accidents due to improperly maintained roadbed should also be considered as a factor.

SPECIAL TRACK WORK IN PAVED STREETS*

An Exposition of the Special Construction Required Where Railroads Occupy Roadways in Cities

BY H. F. HEYL,
With Wm. Wharton, Jr. & Co., Easton, Pa.

OWING to certain conditions imposed by paving and state or municipal laws, tee-rails are not generally allowed to be used in paved streets within city limits. Where it becomes necessary for a steam road to traverse such streets, rails and structures are then used which are similar to those used by street railways. There are practically only four rail sections in use in the United States for such conditions, namely, the 7-in. high sections, P. S. Co. 403 and L. S. Co. 397, and the 9-in. high sections, P. S. Co. 263 and L. S. Co. 384. Of these sections the P. S. Co. 263 (Fig. 1) is almost universally used, a marked contrast with the wide variety of tee-rail and sections. With this condition it can readily be seen that almost all switch pieces can be made alike and interchangeable, and one company's switch be used by another, etc. In addition this means quite a saving in patterns.

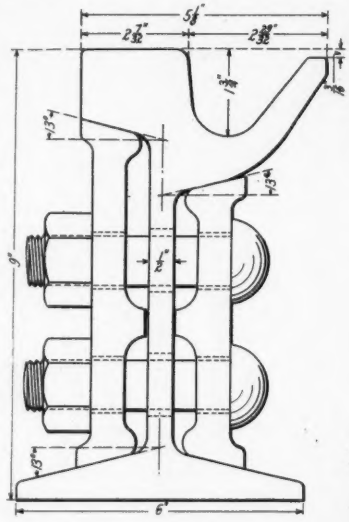


FIG. 1. P. S. Co. 263 RAIL SECTION

Instead of split switches, tongue switches, tongue mates and plain mates are used. The tongue switch and the tongue mate are the pieces with the movabel tongue by which the wheels of the locomotive or cars are either guided into the turnout, or along the main track, depending on how the tongues are set. The tongue switch is the piece placed on the inside of the curve, and the tongue mate or plain mate is the piece placed on the outside of the curve (Fig. 2). There are

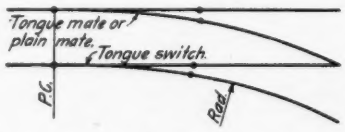


FIG. 2. TONGUE SWITCH AND TONGUE MATE

two ways of using these pieces, either with double tongue pieces (a tongue switch and tongue mate) or with a tongue switich and a palin mate. In case double tongues are used, lugs or projections are cast on the manganese steel tongues to which are fastened connecting bars so that the tongues move in unison when changed from one position to another. These pieces are either made straight or to ascertain strandard radius. This is done to avoid needless patterns and also to allow an easy approach when entering a curve of shorter radium. When the piece is made straight it is usually made at angle corresponding to the angle of a split switch of similar length, if curved, to the following radii which have been practically established as standards: 100 ft., 150 ft., 200 ft., 250 ft. and

FIG. 3. SWITCH TONGUE SET FOR MAIN LINE

400 ft., depending on the size of engines which pass over it. For ordinary shifting engines the 100-ft., 150-ft. and 200-ft. radius switch pieces are used. The other radii are used where large freight and passenger engines pass over switches. Owing to the heavier rolling stock used it has been found most desirable to make these pieces of solid manganese steel rather than of rail cast

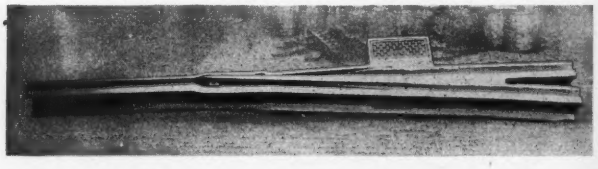


FIG. 4. SWITCH TONGUE SET FOR TURNOUT

into a cast iron body with a manganese steel plate inserted at the point of greatest wear.

No definite standard lengths have been established for such pieces, a few companies specifying certain lengths of their own. These lengths should be the same for each radius used, so as to make the pieces inter-

FIG. 5. TONGUE SWITCH WITH HEAD BLOCK CAST ON THE END

changeable. The following are lengths that are more generally used:

100-ft. and 150-ft. radius, 13 ft. 6 in.
200-ft. radius, 14 ft. 3½ in.
250-ft. and 400-ft. radius, 20 ft. 0 in.

Figures 3 and 4 show a switch with a tongue of 150-ft. radius, the former showing it set for the main line and the latter for the turnout. Some companies make their switch pieces as short as possible in order to save

*This is the last of a series of articles on the design of special track work. The first article, on "The Design of Special Track Work," appeared in the December issue, page 369; the second article, on "The Correct Design of Split Switches," in the January issue, page 13; the third article, on "Standardizing the Design of Frogs," in the February issue, page 41; the fourth article, on "The Design of Railroad Crossings," in the March issue, page 91, and the fifth article, on "The Design of Movable Point Crossings," in the April issue, page 123.

manganese steel. In these cases, instead of running the rails out to full sections as shown in Figures 3 and 4, a heel extension or heel block is cast on to the end of the piece, shaped to the connecting section. Fig. 5 shows a tongue switch and Fig. 6 a rigid type of this style of construction.

Unlike tee-rail work, where only the switch pieces and frogs are ordered from the special track work manufacturer, in this style of construction it is necessary to order the entire layout, as it is almost impossible to bend the heavy girder rail to proper curvature in the field, unless a company has the proper facilities in its shops.

FIG. 6. RIGID TYPE SWITCH WITH HEAD EXTENSION

The frogs (Fig. 7) should also be made of solid manganese steel. They should be kept as near alike as possible as to length and angle. They should also be made as short as possible in order to avoid excessive costs. For standard angle frogs a standard length should be established, while for special frogs the length should be left to the manufacturer to determine.

In concluding this series of articles on special track work, it will be noticed that, notwithstanding the various standardization committees which have been appointed by various societies and associations, very little progress has been made in the adoption of their suggestions and recommendations by the railroads. It is to be hoped that the day is not far distant when a switch or a frog will be so designed as to be acceptable to the majority of engineers. This will mean the saving of needless engineering expense both by the railroads and the special track work manufacturer; it will mean that the special track work manufacturer can keep a certain number of switches and frogs in stock with a reasonable degree of safety of their being disposed of, and finally it means cheaper prices as these materials can then be made in larger quantities.

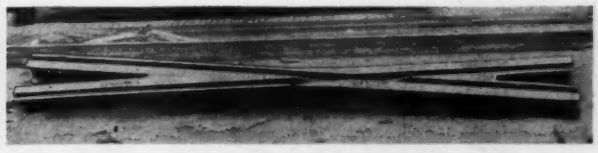


FIG. 7. A SPECIAL FROG FOR USE IN STREETS

Straightening Surface Bent Rails

BY J. RODMAN

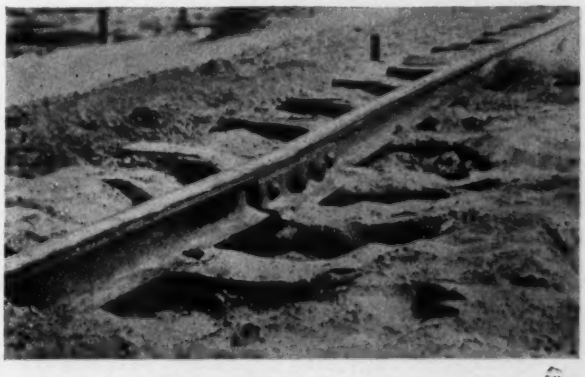
ON a stretch of about 15 miles of track in California, laid in the natural sand ballast and equipped with angle bars, the joints settled faster than the section crews could restore them to surface. As the track grew older they became steadily worse until several thousand joints were surface-bent, apparently to a hopeless extent. As the joints and angle bars became depressed the quarters were superelevated to an abnormal degree and they were retained above the normal surface by the dry, powdery sand filtering under the ties, while the joints continued to "pump" and grow worse.

The track was laid with a good quality of 60-lb. rail, equipped with standard fastenings, and was subjected to unusually bad natural conditions. Proximity to the ocean caused the bolts and spikes to deteriorate rapidly from rust. As the rust-weakened bolts became unable to withstand the original strain and the consequent stretching, together with the scaling of rust from the points of contact resulted in a very slight play or vibration. This condition was probably the beginning of the numerous low joints through the beach sand. As fast as the joints lost in rigidity "pumping" began.

Raising the joints with a track jack in the usual manner merely made matters worse, as the elevating force encountered insufficient downward resistance to break the quarter arches and to "buckle" the joint. Also, as the joints were raised the quarters were elevated in proportion to their former position above the joints, making the general surface even worse by the operation.

New rail fastenings of good design were finally applied to the worst joints in the hope of partially correcting them, but the rails were bent so badly and the joints were depressed to such an extent that the newer fastenings became surface-bent in conformity to the curve of the rails. For a time, perhaps a month or so, the application of the newer splices eased the worst joints, but after they became bent, raising and tamping were of no more avail than formerly.

Naturally, the line was in a very bad condition, and even a fair line could not be maintained. The various foremen in charge worked with their crews assiduously,



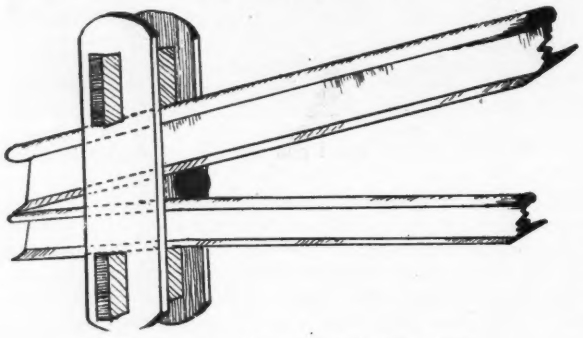
SHOWING THE EFFECT OF PUMPING

but the track became steadily worse. Many of the newer splices were removed and others applied in a last desperate effort. Some of the discarded splices had been in service less than six months, but owing to their "sway-backed" condition they were considered fit for nothing save possibly sidetrack relaying purposes.

On an adjoining section the sand was of a coarser grade and slightly more stable; yet there were also many

surface-bent joints from the same conditions and as difficult to maintain. After doing everything else possible with the section gangs the surface-bent joints were corrected by the simple process shown in the drawing.

After releasing the fastenings of the rail in the track, 15 ft. of rail weighing 30 lb. more per yard was placed ball upward on the rail to be straightened. The ends were clamped together by means of the arrangement shown in the drawing, with a lining bar or other fulcrum inserted between the rails as close as possible to the clamp. The weight and pressure on the lever rail

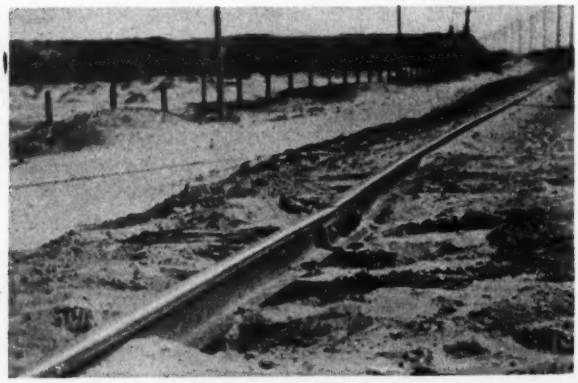


METHOD OF CROWNING RAIL ENDS

straightened the bent rails to the desired surface. On the worst ones the weight of an extra rail was added to the lever, after which seven laborers bent it to surface without excessive effort.

The rails fitted the general surface nicely, and even a slight apex was noticeable on many of them; but in attempting to replace the old bent splices it was found that they could be reapplied only with great difficulty and waste of labor and that their lack of conformity again would tend to depress the corrected rail.

To overcome this difficulty the splices were also bent back. Two rails, with the ball upward and the ends together, were lined on three timber skids. The bent fastenings were applied fairly snug and secured with one bolt. Then two laborers, one at each end, thrust lining bars through the bolt holes and turned the rails until they swung inverted and clear of the central blocking, giving a clear span for the length of the two rails. The wrench man then added his weight to the suspended joint, while the laborer assigned to the sledge struck the base of the splices until the desired effect was obtained.



RAILS AFTER APPLICATION OF UNCROWNED SPLICES

After experiments were made with splices crowned to various ordinates it was found that the strength of the splices acting with the resulting slight arch in the joints to which they were applied was sufficient to correct and retain even the worst of the surface-bent joints, although the use of the lever rail was continued on the extremely bad depressions.

Such complete success in maintaining good surface in the sand resulted from the use of the "humped" splices that even the apparently useless pieces from the scrap pile were resurrected, and, save for the few that cracked in the process of reversing, they were found to be perfectly serviceable after treatment. Splices crowned from ⅛ to ¼ in. were applied to every low joint in the sand track. After nearly a year of hard service not more than four or five per cent at most of the corrected joints show any sign of decline; and as the inclination of those few is upward from the strain of the arched splices, they are easily raised and maintained.

The method of applying the arched plates varies slightly from the usual procedure. The rail is beaten free from dirt and rust and the two free ends are raised until they meet the lines of the desired arch. The splices, previously cleaned and coated with crude oil, are applied and hammered snug, and the bolts are tightened just short of stretching. Only the two joint ties are tamped, the shoulder ties being left free to depress. The old splices were cleaned by heating over a wood fire until the expansion of the metal slipped the rust bond, when a few blows with a maul removed the scale.

AFTER CROWNED SPLICES WERE INSTALLED

As no accurate figures were kept during the experimental stages, the exact costs throughout are rather difficult to ascertain. Each pair of the scrapped and apparently useless splices used meant a clear saving of the cost of a new pair, less the scrap value of the old ones. A foreman and seven laborers, under ordinary conditions, was able to crown, clean and apply at least 30 pairs in one day.

TIE RENEWALS IN CANADA

THE tie renewals by the railroads of Canada during 1915 amounted to a total of 7,399,753, or 38½ per cent of the tie renewals during 1914, when 19,196,208 ties were placed in track. Including those used by electric railways, the total number of ties for 1914 was 7,592,530. These figures are based on reports received from 44 steam railways and 27 electric railways and were taken from a bulletin prepared by the Canadian Interior Department's forestry branch under the direction of R. H. Campbell, director of forestry. Of the total number of ties only 318,991 were treated with preservatives. This is about 5 per cent of the total as compared to 7 per cent in 1914 and 10 per cent in 1913. The number of cross ties imported in 1915 was 1,219,594 and consisted principally of oak, hard pine, chestnut, sycamore and gum, all species of wood not abundant in Canada.

In the accompanying table showing the purchase of

ties for 1914 divided according to species it is seen that jack pine supplied one-third of the total, with eastern cedar second supplying one-fourth. The average price paid by the railroads for cross ties in 1915 was 44 cents, one cent less than for 1914.

Cross-Ties Purchased by Canadian Railways in 1915

Kind of Wood	Number	Value	Av'ge Value	Per Cent
Total	7,399,753	$3,229,000	$0.44	100.0
Jack pine	2,462,733	985,706	0.40	33.3
Eastern cedar	1,864,398	856,584	0.46	25.2
Hemlock	776,586	300,335	0.39	10.5
Tamarack	619,923	224,331	0.36	8.4
Eastern spruce	508,321	138,287	0.27	6.9
Douglas fir	393,097	152,902	0.39	5.3
Oak	315,907	225,284	0.71	4.3
Birch	189,153	187,572	0.99	2.5
Hard pine	95,783	66,238	0.69	1.3
Chestnut	58,802	26,819	0.50	0.7
Maple	42,915	29,195	0.68	0.6
Elm	21,078	9,695	0.46	0.3
Western cedar	14,129	5,063	0.36	0.2
Sycamore	13,195	6,209	0.47	0.2
Gum	13,195	6,209	0.47	0.2
Beech	12,388	7,776	0.63	0.1
Red Pine	2,000	500	0.25	*
Western spruce	1,086	269	0.25	*
Ash	64	26	0.41	*

*Less than one-tenth of 1 per cent.

The Sale of City Water to Railroads*

BY C. R. KNOWLES,
Superintendent of Water Service, Illinois Central, Chicago, Ill.

DURING the year ending June 30, 1916, the Illinois Central purchased water amounting to over $100,000 from 34 water plants in Illinois alone. This is an average of nearly $3,000 per year per plant. At none of the points included in the above figures does the annual expense for water fall below $600 and at some points (Centralia, for example) the expense for water amounts to over $12,000 annually. Using the water purchased by the Illinois Central in this state as a basis, the railroads of the United States purchase annually from city plants over $10,000,000 worth of water. This represents no inconsiderable proportion of the revenue from the operation of these water plants.

The consumption of water for all purposes by the railroads of the country is estimated to be nearly 700,000,000,000 gal. per year. Compared with this enormous figure the water purchased from city plants is small, and it would appear that the railroads are undeveloped as a field for the sale of water. This brings up the question as to what should be the relation of the railroad to the city water plant. Should it be the same as that of the ordinary householder using only a few thousand gallons, or that of a large, long hour, high load factor consumer, whose business permits of utilizing the reserve pumping capacity, thereby increasing the efficiency of the plant?

The cost of supplying water may be divided into two charges: first, the fixed expense or cost of readiness to serve, which remains the same regardless of whether the plant is operated to full capacity or not; second, the operating expense which varies with the amount of water pumped. Assuming the plant has ample reserve capacity, the cost of furnishing water to the railroad or other large consumer will consist of the fuel, chemicals, oil, waste, etc., and any return in excess of the actual operating expenses for such water furnished may be applied to the reduction of the overhead expense, to other consumers.

Companies furnishing electricity for power are probably the most efficiently conducted public service institutions in existence. This efficiency is largely attained through operating the power plants to as nearly full capacity as possible by securing an output for the power produced through attractive rates to large consumers utilizing the off-peak load. The prevailing rates for electric power in Illinois are from 4 to 11 cents per kilowatt hour. Special rates for large, long hour, high load factor consumers and discounts for off-peak service, however, bring the cost down to 1 and 1½ cents per kilowatt hour. The electric power companies have made these low rates for two reasons: First, that the highest efficiency is attained when the plant is operated under full load and from the realization that there is a limit to the charges that may be made for electricity, that limit being reached where the cost of current equals the cost of steam or other power. The same thing is true of a railroad water supply. The limit is reached in the cost of water from city plants when the cost equals or is in excess of what it will cost the railroad to pump its own water. The railroad is in a position to say what the water should cost by reason of having a water department organization and perhaps in this respect has a different relation to the water plant than other large consumers.

The fallacy of a universal rate for water to all consumers regardless of consumption is recognized by most waterworks managers, and sliding scales of rates are established in many instances. These rates are, of course, based upon all expenses, fixed and otherwise, and do not provide for differential treatment of large consumers where it is necessary to make certain concessions in order to hold the business or secure new custom.

No better exposition of the advantages of differential treatment of customers can be given than that of Knowles and Scharff in their paper on "The Relation of Out-of-Pocket Cost to Rate Making," in the proceedings of the Illinois Water Supply Association, 1914, as follows:

"There remains, then, only the second basis which seems to us proper as a reason for differential treatment of consumers—in order to lower the cost to other consumers by retaining custom which would otherwise be lost. How this works out may be very readily explained. Assume a small waterworks with a gross income of $35,000, which must be collected when it is supplying 1,000,000 gal. per day. Now suppose one large consumer using 100,000 gal. per day and paying $3,500 per year should find that he could secure water elsewhere at a cost of $2,500 per year, and should disconnect from the mains. The amount supplied would drop to 900,000 gal. per day; but interest, depreciation and maintenance would remain practically the same. It would still be necessary to have the same number of engineers and firemen; and the only saving would be a small amount of fuel, alum, hypochlorite, oil and waste, etc., which would certainly not be in excess of $1,000 per year and would probably be a great deal less, so that the gross income to be raised might be reduced to say $34,000, all of which would have to be raised from other consumers.

*Read before the Illinois Section of the American Water Works Association, Champaign, Ill., March 13.

Now, it all other conditions remained the same, and the rate for the large consumer were reduced so as to just hold his custom, when paying $2,500 per year, the total gross income would still be $35,000 and the portion to be raised from consumers other than the large one would be $32,500, or $1,500 less than in other cases. Their rates could, of course, be correspondingly lower than would be necessary if the large consumer were lost. The advantage of such an arrangement to all of the consumers is obvious, and such differential treatment, if necessary to secure this advantage, would not only not constitute discrimination, as we have defined it, but would appear to be a plain duty of the waterworks as a public utility.

"In brief, it is to the advantage of all consumers that large, long hour, high load factor consumers be retained. Differential treatment of them does not constitute discrimination, so long as it will result in advantage and saving to other consumers. Such concessions in rates, however, must not be greater than actually necessary to meet the competition of other sources of supply, as in any case they must not be so great as to increase instead of decrease the income to be collected from other consumers. Thus in the case cited above, if it were possible to get the business at $2,500, any rate less than that sum would constitute discrimination. While if it were really necessary in order to meet competition, any rate greater than $1,000 per year would effect some saving for other consumers, and would be justifiable. A rate less than $1,000, however, would make the amount to be collected from other consumers greater than if the large consumer ceased entirely to take service. This would certainly be discrimination under our definition."

In view of the facts as to ratemaking as brought out above it would appear that in many instances more attractive rates could be made the large consumers, such as railroads, rather than suffer the loss of business that will perhaps decrease the income to such an extent as to make it necessary to increase the rate for water furnished the remaining consumers to make up the deficit. Aside from the advantage of the large consumer in keeping down the unit cost through absorbing a portion of the overhead or readiness to serve expense, a number of instances might be cited where the acquisition of one or two large consumers has made it possible to enlarge and improve the pumping plant and even construct new plants.

Another writer has strongly advised the waterworks managers to cultivate a wider market for the sale of water by encouraging irrigation of truck farms and family gardens. He stated further: "Water is a marketable commodity. Were as much ingenuity expended in marketing water as in electricity there is probably not a waterworks plant in America that would not be able to double the quantity of water sold." Undoubtedly there are great possibilities in encouraging new uses for water, but as water is one of the prime necessities in the operation of a steam railway, the market is already at hand and waterworks managers would have but little difficulty in finding a market for the sale of water if they would apply the same methods that prevail in other business lines, namely, to divide the profits with the customer if necessary to get the business.

ALASKAN TIMBER SUPPLY.—The stand of timber on the two great national forests in Alaska is estimated by the United States forest service as 70,000,000,000 board feet, while the annual growth will, it is said, produce of pulp wood alone enough for the manufacture of 3,000 tons of this material a day.

THE MATERIAL MARKET

THE middle of April witnessed the first inquiries for rails for 1919 delivery, a most emphatic demonstration of the remarkable condition of the rail market, since it shows that the railroads must arrange for their rail requirements two years in advance of the date of delivery. The 1918 market has been virtually closed for some time, although an order for 40,000 tons was placed recently by the Northern Pacific. The inability to secure new rails at any price within 21 months or more has placed a high premium on rails suitable for relaying or even rerolling. The former are now worth nearly as much as new rails, bringing $39 to $40 at Chicago, $37 to $38 at Cleveland and $36 to $38 at St. Louis. Rails suitable for rerolling are being sold at $34 to $35 at Pittsburgh and Cleveland, and $33 to $34 at Chicago.

The preparation which this country is now making for war is no small factor in a continuation of the present high prices of iron and steel with not a few increases. Track spikes have again advanced and are now quoted at $3.85 per 100 lb. in Pittsburgh and $3.80 in Chicago. Track bolts are also higher, bringing $5.50 and more per 100 lb. at Pittsburgh. The price at Chicago is about $1 less, indicating that a change will take place soon. No change has taken place in the price of tie plates, which remain $60 and $65 per ton. Recent orders for these include one of 25,000 tons from the Illinois Central and one of 900,000 tie plates for the Philadelphia & Reading.

The price of plain structural materials has not changed appreciably during the month, but is now so high that very few contracts for structural materials have been let by the railways during recent weeks upon which typical prices may be deduced. However, a comparison of the prices prevailing during the last three or four months with those obtained during normal times is of interest as indicating one phase of the increase in the cost of railway construction. During normal times the pound price of fabricated structural steel railway bridges F. O. B. bridge shops varied from slightly less than 2 cents for deck plate girders during slack times to about 2¾ cents for riveted truss spans during times of business prosperity. In contrast to these, a large tonnage contracted for about the first of this year contained the following pound prices: I-beams, 4.0 cents; deck girders, 4.5 cents; through girders, 4.48 to 5.55 cents; through riveted trusses, 4.9 cents. A contract for a 150-ft. riveted Pratt truss span was let about January 1 for 5.1 cents and some deck girder spans were let about February 1 for 4.8 cents. Delivery stipulations have a marked influence on the bids received for any inquiry, causing them to vary materially with the ability of the shop to secure material. On a track elevation subway, bids received during the month of March varied from 4¾ cents to nearly 6½ cents for immediate delivery from material taken from stock, while the tenders on the same structure based on mill orders with deliveries about 8 to 12 months in advance varied from slightly less than 5 cents to more than 6 cents.

From reports received from various railroads it is clear that these conditions are forcing the roads to make larger substitutions of concete structures and timber structures, particularly the latter. The prices of lumber are still relatively low, but with the increased demands, influenced in a considerable measure by the building of wooden ships, there is every indication of an advance in the prices of this commodity. What present conditions will do to the price of cement is problematical. No change has taken place recently and as there are indications of some reduction in new construction the price may remain stationary.

GENERAL NEWS DEPARTMENT

THE PENNSYLVANIA RAILROAD has announced that employees may use unoccupied land of the company for cultivating food crops this summer.

THE BUFFALO, ROCHESTER & PITTSBURGH has offered the unoccupied land along its right of way to employees for cultivation, and to help the movement get a start, has offered to furnish seed potatoes.

THE BALTIMORE & OHIO, the Pennsylvania and the Western Maryland have combined to provide a hospital train for the Maryland soldiers when needed. The train is being fitted up at the shops of the Western Maryland.

THE CONSTRUCTION of the United States Government Railway in Alaska has now been in progress for two years, and the 71 miles of the Alaska Northern purchased by the government has been restored to traffic. Track has been laid on 73 miles of new line and clearing and grading has been in progress on about 100 miles in addition.

THE INTERSTATE COMMERCE COMMISSION has granted all the railways of the country permission to file tariffs increasing freight rates generally 15 per cent, effective June 1. Hearings on these increases have begun at which each side is being given an opportunity to state its views before the Commission gives its decision or the tariffs become effective.

THE AMERICAN RAILWAY ASSOCIATION'S statement of the car situation on April 1 showed a total shortage of 143,059 freight cars, an increase of 12,977 over March 1, and the largest shortage ever reported by the railways. On the same date 89,371 loaded and empty cars were accumulated at various points where they could not be moved.

THE ST. LOUIS-SAN FRANCISCO has issued instructions from the office of the president, to fly an American flag on each locomotive in service on the entire system. The stars and stripes, in addition, will be put on all station buildings along the line. The flags will be furnished by the company, although it is stated that the idea originated with the employees themselves.

THE GREAT NORTHERN has issued bulletins to its employees stating that all of its men enlisting in the army and navy of the United States will have their positions restored to them upon returning from such service, and also that all seniority and pension rights will be retained. The Northern Pacific has issued similar bulletins from the office of the vice-president.

THE BOSTON & ALBANY has made an advance of 5 per cent in the pay of all classes of employees who are not subject to the Adamson law, excepting those receiving $150 or more monthly. It is estimated that this will increase the annual payrolls about $250,000. The New York, New Haven & Hartford has advanced the wages of laborers, including track men, 10 per cent.

ALL MAILS CARRIED by railroads are now being weighed throughout the country. Beginning on March 27, and for a period of 35 days, the weight is being taken of all mails which are carried under the space-rate system as put in effect last November, and on the closed pouch routes, where the space rate has not been put in use, the weighing is to be continued for 105 days.

The St. Louis-San Francisco has granted permission to the general public, and to its employees as well, to make use of unoccupied tracts on its right of way for agricultural purposes, charging therefor a nominal fee of $1, which is necessary to make the transaction legal. The Frisco and its subsidiary companies operate 5,254 miles of line, the right of way for which varies from 50 to 200 ft. in width. Applicants are required to call on the station agents, who forward the information for the preparation of a lease to the superintendent.

E. H. WALKER, president of the Railway Supply Manufacturers' Association, on April 18 announced to the members of this organization that the convention of that association, which was to have been held at Atlantic City, N. Y., June 13 to 20, at the time of the meetings of the Master Mechanics' and Master Car Builders' Associations, has been postponed for one year. It is expected that the two railway associations will take similar action. This action was taken because of their desire, as patriotic citizens, to conserve their time and resources, holding them subject to the call of the country's necessities.

PLANS FOR THE CO-ORDINATION of activities of railways of the United States so that they can be operated as a single system to meet the transportation needs of a country at war are being prepared. The work is in the hands of a committee of 28 railway executives divided into six groups and supervised by a central executive committee, of which Fairfax Harrison, president of the Southern Railway, is chairman. This executive committee will sit at Washington as frequently as necessary to carry on the important work imposed upon it.

THE NORFOLK & WESTERN announces that a relief and pension department will be put in operation on that road July 1 next. All officers and employees will be retired at the age of 70; and, under certain conditions, at ages 60 to 65, inclusive. The basis of the pension allowance will be 1 per cent of the average salary of the employee for the ten years preceding retirement, multiplied by the number of years that he has served. For example, an employee who has received $1,000 a year, and who has been in the service 40 years, will receive $400 a year.

THE LEGISLATURE OF ARKANSAS has passed a law applying to only a single county, requiring railways to drain their roadbeds by the construction of ditches and under drains. In incorporated cities tiling must be used. A bill of like intent introduced in the Kansas legislature proposes to require the railroads, where crossing streets leading to cemeteries in cities of 7,000 or more, to repave, remacadamize or resurface with vitrified brick the space between the rails and for a distance of 18 in. outside them whenever such streets are improved by the cities.

RALPH PETERS, president of the Long Island Railroad, has written a letter to employees of the road, pointing out that, in case of war, their duty to the country will require them to stay in their places. In the event of war the railroads will be essential to national defense, and it would be a calamity for them not to be well organized and completely manned. The appeal is intended not only for men who might feel it a duty to enlist in the ranks, including those who might do so in order not to be classed as "slackers," but also to the man who is tempted to accept a better paying job in the manufacture of war supplies.

THE E. H. HARRIMAN MEMORIAL MEDAL, awarded for excellence in promoting safety, has been given, for the year 1916, to the Alabama Great Southern. During the year not a single passenger or employee was killed in a train accident on that road, and there was only one fatal accident from any cause. A silver replica of the medal was given to the Illinois division of the Illinois Central. A bronze replica, granted yearly to the individual who has been most conspicuous in the promotion of safety and health, is awarded, for 1916, to James A. McCrea, general manager of the Long Island, for his publicity campaign and other activities in connection with safety at highway grade crossings.

THE ILLINOIS PUBLIC UTILITIES COMMISSION has issued a new order covering the clearances of structures along railroad tracks and applying to new construction only. The distinctive feature of this order is a differentiation between passenger tracks and freight tracks. Main tracks are required to be spaced 13 ft. 6 in., center to center, unless used only for passenger service, in which case the spacing may be 13 ft. The side clearance for bridges is 8 ft. from the center line of tracks, but may be reduced to 7 ft. 6 in. in the case of bridges used only for subsidiary passenger tracks. The order also takes into account the modified conditions existing at shops, roundhouses, coaling stations, etc., and permits side clearances of 7 ft. and a vertical clearance of 17 ft. The order is especially complete, with special provisions for house tracks, classification yards, switch stands, water cranes, semaphore signals, etc.

PERSONAL MENTION

GENERAL

J. B. HUTCHINSON, JR., division engineer of the Pittsburgh division of the Pennsylvania Railroad, has been appointed assistant superintendent of the same division, effective April 15.

FREDERICK MCQ. FALCK, who has been appointed assistant general manager of the Philadelphia & Reading, with headquarters at Reading, Pa., entered railway service in the maintenance of way department. He graduated from Cornell University in 1894 and began railway work with the Philadelphia & Reading on June 1, 1898. He was appointed assistant supervisor at Shamokin, Pa., in August of that year and was promoted through the grade of supervisor to division engineer in May, 1903. In October, 1910, he was appointed assistant superintendent of the Wilmington and Columbus division at Reading, since which time he has been in the operating department.

EDWARD J. PEARSON, who has been elected president of the New York, New Haven & Hartford, effective May 1, succeeding Howard Elliot, resigned, began railway service as a rodman on the Missouri Pacific in 1883. He was employed in the engineering departments of several western roads, becoming assistant engineer on the Northern Pacific in 1883, supervisor of bridges and buildings and water supply in 1885, division engineer in 1890, division superintendent in 1894, and chief engineer in 1904. From December, 1905, till June 1, 1911, he was chief engineer of the Chicago, Milwaukee & Puget Sound, resigning on the latter date to become first vice-president of the Missouri Pacific system. He was appointed vice-president of the New Haven in charge of construction, operating and maintenance on March 9, 1916.

FRANK H. ALFRED, who has been elected president of the reorganized Pere Marquette, began railway work as a rodman on the construction of the Columbus, Lima & Milwaukee in 1887. After being employed on the Norfolk & Western, the Cleveland, Akron & Columbus and the Wheeling & Lake Erie, he became assistant engineer of the Pere Marquette in 1900. He was made chief engineer in October, 1902, resigning on October 1, 1905, to become manager of the Canadian White Company, Ltd. In 1908 he returned to railway service, as assistant to the president of the Cincinnati, Hamilton & Dayton. In April, 1912, he was appointed assistant general manager of the Pere Marquette, being made general manager later and then chief executive officer for the receivers, which position he held at the time of his recent promotion.

EDWARD N. BROWN, who has been elected chairman of the board of directors of the recently reorganized Pere Marquette, is an engineer by training, entering railway service as a rodman on the North Eastern Railway of Georgia in 1878. After serving as division engineer and resident engineer on the Central of Georgia he went to Mexico in July, 1887, where he became engineer in charge of the construction of the line of the Mexican National, between Saltillo and San Luis Potosi. In September, 1888, he was appointed division superintendent, with headquarters at the same point, from which time his experience has been in the operating and executive departments. He was made vice-president and general manager in March, 1902, and president of the National Railroad of Mexico in April, 1904. In 1909 he became president of the National Railways of Mexico, which position he held until October, 1914, when he resigned because of the unsettled conditions in that country.

ENGINEERING

C. E. NAGLE has been appointed chief engineer of the Louisiana & Pine Bluff, with headquarters at Huttig, Ark., succeeding W. H. Lee.

J. F. SCHWED, of the engineering department of the New York Central Lines West at Cleveland, Ohio, has been appointed first assistant engineer of the Lake Erie & Western at Indianapolis, Ind. This is a newly created position.

E. B. EPPES, chief engineer of the Georgia & Florida, with headquarters at Augusta, Ga., has had his authority extended over the Augusta Southern.

C. J. RICH, has been appointed division engineer of the Pere Marquette, with office at Saginaw, Mich., succeeding J. E. Johnson, resigned to accept service with another company.

C. C. CUNNINGHAM, roadmaster of the Chicago, Rock Island & Pacific at Liberal, Kan., has been appointed division engineer, with office at Dalhart, Tex., succeeding A. J. Wise, who has resigned.

W. H. VANCE, chief engineer of the Louisiana & Arkansas, with office at Stamps, Ark., has been appointed engineer maintenance of way of the St. Louis Southwestern, with office at Tyler, Tex.

BERNARD BLUM, acting division engineer of the Northern Pacific Lines East of Mandan, N. D., has been appointed division engineer of these lines with headquarters at St. Paul, Minn., effective April 15.

C. F. BURRELL, engineer and roadmaster of the Kentucky & Indiana Terminal, Louisville, Ky., has been appointed engineer maintenance of way, and James McDonald has been appointed roadmaster. The office of engineer and roadmaster has been abolished.

M. H. DOUGHTY, assistant to the chief engineer of the Delaware, Lackawanna & Western at Hoboken, N. J., has been appointed division engineer with office at Hoboken, succeeding G. T. Hand, who has resigned to accept service with another railroad. A sketch of Mr. Doughty's career was published in the *Railway Maintenance Engineer* of April, 1917, page 130.

R. N. PRIEST, an engineer engaged on construction on the Atchison, Topeka & Santa Fe, has been appointed division engineer at Arkansas City, Kan., succeeding H. J. Moore. L. G. Harris, acting division engineer at La Junta, Colo., has been appointed division engineer at this point, succeeding Claude Betson. Irving Anderson, office engineer at Chicago, Ill., has been appointed acting division engineer at Marceline, Mo., succeeding W. C. Baisinger, transferred.

LOUIS YAGER, acting engineer maintenance of way of the Northern Pacific Lines East of Paradise, Mont., has been appointed engineer maintenance of way of these lines with headquarters at St. Paul, Minn., succeeding Andrew Gibson, who has been appointed superintendent of tie treating and timber preservation plants with headquarters at Brainerd, Minn. Mr. Gibson succeeds Lowry Smith, transferred to special work. These appointments were effective April 15.

LAWRENCE M. TOWNSEND, acting division engineer of the Atchison, Topeka & Santa Fe, with office at Dodge City, Kan., has been appointed office engineer at La Junta, Colo., succeeding F. M. Haag, assigned to other duties. He was born at Cincinnati, Ohio, January 29, 1887, and graduated from the Ohio Mechanics Institute, Cincinnati, in June, 1904. On January 13, 1907, he entered the engineering department of the Atchison, Topeka & Santa Fe and on January 10, 1916, was appointed acting division engineer at Dodge City, succeeding G. J. Graves, assigned to valuation work. As Mr. Graves returned to his former position at Dodge City on May 1, Mr. Townsend is appointed office engineer at La Junta, effective on the same date.

EDWARD B. ASHBY, chief engineer of the Lehigh Valley, has been appointed consulting engineer with headquarters at New York. Mr. Ashby was born at Buffalo, N. Y., on May 23, 1864, and graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1886. He entered railway service in the office of the engineer maintenance of way of the Philadelphia & Erie, now a part of the Pennsylvania, at Williamsport, Pa., in the same year. He was supervisor and later an engineer on this road until 1897, when he was appointed principal assistant engineer maintenance of way of the Baltimore & Ohio. He was made assistant engineer maintenance of way of the Lehigh Valley in 1899, and engineer maintenance of way the following year. He was appointed chief engineer in 1908, which position he held until his recent appointment became effective.

GEORGE T. HAND, division engineer of the Delaware, Lackawanna & Western at Hoboken, N. J., has been appointed chief engineer of the Lehigh Valley with office at New York City, succeeding E. B. Ashby, who has been appointed consulting engineer. Mr. Hand formerly was in the engineering department of the Lehigh Valley, and returns to that line after a number of years' service with the Delaware, Lackawanna & Western. He was born in Elizabeth, N. J., and his first railroad work was as a rodman on the National Docks Railway, now a part of the Lehigh Valley. Later he was principal assistant engineer and assisted in the construction of the piers, warehouses and other facilities in the Jersey City terminals of the Lehigh Valley at National Docks. After going with the Lackawanna, Mr. Hand has been successively assistant engineer, where he was engaged in the construction of the Hoboken freight and passenger staions, terminal engineer and finally division engineer in charge of the Morris and Essex division. Mr. Hand has also done important consulting work for the Chicago, Milwaukee & St. Paul Railway, and the cities of Newark and Perth Amboy, and also in the construction of tidewater terminals in both North and South America.

HARRY ALFRED LANE, who has been appointed chief engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., as has already been announced in these columns, was born on July 30, 1874, at Foxboro, Mass. After completing a four years' course at Tufts College in 1897, he later took a post-graduate course for three years. While a student he spent his summer vacations in the engineering department of the New York, New Haven & Hartford, starting in 1895 as a rodman on an engineering corps. In September, 1900, he was appointed transitman at Tiverton, R. I. He was promoted to assistant engineer in November, 1901, and put in charge of the northern half of grade crossing elimination work at Fall River, Mass. Mr. Lane became connected with the Baltimore & Ohio in 1902, and in 1914 he became a field engineer. He was promoted in April, 1905, to the position of assistant engineer in charge of all field engineers and parties, preliminary surveys, locations, office projections and reports for extensions and betterments. In July, 1907, he was placed in charge of the designing of freight terminal improvements, and one year later was appointed assistant to the engineer of maintenance of way. In June, 1910, he was promoted to assistant engineer of surveys, and since September, 1916, was assistant to the chief engineer, until his recent appointment as chief engineer of the same road, as above noted.

HARRY A. LANE

JOHN HERVEY CHARLTON has been appointed chief engineer of the Boyne City, Gaylord & Alpena, with office at Boyne City, Mich. He was born at Christiansburg, Va., on October 2, 1878, and received his education at the Virginia Polytechnic Institute. He entered railway service in April, 1901, as an instrument man with the Virginia-Carolina, going to the Carolina, Clinchfield & Ohio as a levelman on location the following June. In November, 1901, he was appointed assistant engineer on the Marion & Rye Valley and in December, 1903, he was placed in charge of a locating party for a private engineering firm at Radford, Va. In November, 1904, he returned to the Virginia-Carolina and the following year was appointed resident engineer, then going to the Carolina, Clinchfield & Ohio as engineer in charge of a locating party. In 1910 he was appointed resident engineer of the Western Maryland, in charge of the Cumberland-Connellsville extension, and in January, 1912, became locating engineer for the Virginia-Carolina. In June, 1912, he was engaged on the Elkhorn extension of the Carolina, Clinchfield & Ohio and was appointed resident engineer for this same company in October, 1914. From November, 1915, to April, 1916, he was resident engineer for the Savannah & Northwestern, being appointed assistant engineer of the Virginian at this latter date. He now succeeds M. D. Gates, resigned.

J. O. HACKENBERG, supervisor on the Pittsburgh division of the Pennsylvania Railroad, with headquarters at East Liberty, Pa., has been promoted to division engineer of the Allegheny division, with office at Oil City, Pa., succeeding D. T. Easby, transferred. Mr. Hackenberg was born at Milton, Pa., in February, 1878, and was educated at the Milton High School and Bucknell University. He entered the employ of the Pennsylvania in May, 1900, as a rodman on the Cambria and Clearfield divisions at Cresson, Pa. In 1901 he was transferred to the chief engineer's department as levelman, and in 1902 was advanced to transitman in the office of the principal assistant engineer at Altoona, Pa. In March, 1903, he was promoted to the position of assistant supervisor at Millersburg, Pa., and was transferred to the main line as assistant supervisor of the Middle division in 1904. He was promoted to supervisor of the Allegheny division in September, 1905, and in 1908 was transferred to the Baltimore division. In June, 1913, he returned to the main line as supervisor of the Pittsburgh division, which position he held at the time of his recent appointment.

J. O. HACKENBERG

C. C. COOK, who has been appointed district engineer maintenance of way of the West Virginia district of the Baltimore & Ohio, with headquarters at Wheeling, W. Va., entered the service of the Baltimore & Ohio on May 9, 1900, in the engineering department as a chainman at Grafton, W. Va. He subsequently served as levelman and transitman until June, 1903, and then as assistant resident engineer and field engineer on construction and surveys at Pittsburgh and Baltimore. From December, 1905, to August, 1909, he was chief draftsman on surveys in the chief engineer's department at Baltimore and at Morgantown, W. Va., and then was assistant engineer maintenance of way at Cincinnati, Ohio, until September, 1910, when he was transferred in the same capacity to Baltimore, Md. In November, 1911, he was appointed division engineer at Philadelphia, Pa., and in May, 1913, was transferred in the same capacity to Pittsburgh, which position he held at the time of his recent appointment as district engineer maintenance of way of the West Virginia district of the same road, as above noted.

C. C. COOK

JAMES EDWARD JOHNSON, division engineer of the Pere Marquette, with office at Saginaw, Mich., has been appointed division engineer of the Michigan Central, with headquarters at St. Thomas, Ont. He was born at Tipton, Ind., August 25, 1883. Completing his education at the Ohio State University, he entered the engineering department of the Cincinnati, Hamilton & Dayton in 1905. In July of that year he entered the engineering department of the Lake Shore & Michigan Southern, and in January, 1906, assumed a similar connection with the Vandalia. From September, 1906, to February, 1907, he was in the employ

of the Missouri Pacific, being then appointed division engineer on the Hocking Valley. In October, 1912, he was made division engineer on the Pere Marquette, which latter position, as noted above, he held at the time his present appointment became effective. He succeeds S. D. Williams, Jr., assigned to special duties elsewhere.

WALT DENNIS, assistant engineer of the Chicago, Rock Island & Pacific, with office at Chicago, Ill., has been appointed principal assistant engineer of the Wabash, with headquarters at St. Louis, Mo. He was born at Alliance, Ohio, in 1879 and graduated from the Kansas State University in 1900. He entered railway service with the Kansas City Southern as an axeman and rodman in the maintenance of way department in 1900. During 1902 he was in the employ of Waddell & Hedrick, Kansas City, Mo., as a bridge draftsman. In 1903 he went with the Kansas City, Mexico & Orient on location and construction work. In 1904 he was appointed chief delineator on double track and new construction work on the Union Pacific, and in 1906 became associated with Horace G. Burt, consulting engineer, on special reports in connection on grade reduction. In 1907 he returned to the Kansas City Southern as office engineer. In 1912 he joined the engineering department of the Chicago, Rock Island & Pacific and was successively up to the time of his present appointment location engineer, construction engineer, special engineer and assistant engineer on special investigations over the system.

WALT DENNIS

WILLIAM SCOTT CAMPBELL has been appointed manager and chief engineer of the Kentucky & Indiana Terminal Railroad, with headquarters at Louisville, Ky., succeeding J. H. Rightmeyer, resigned. He was born on December 19, 1879, near Centralia, Ill., and was educated in the public schols of Patoka, Ill. He began railway work in October, 1897, at Joliet, Ill., with the Elgin, Joliet & Eastern, as a switchman. He later served successively as brakeman and conductor, and from February, 1900, to August, 1914, was, consecutively, general yardmaster, trainmaster and superintendent of terminals on the same road. From July, 1915, to March, 1917, he served in the transportation and operating departments of the Southern Pacific at San Francisco, Cal., and now becomes manager and chief engineer of the Kentucky & Indiana Terminal Railroad, as above noted.

W. S. CAMPBELL

H. S. RUSSELL, division engineer of the Middle division of the Pennsylvania Railroad at Altoona, Pa., has been transferred to the Pittsburgh division; C. E. Brinser, division engineer of the Monongahela division, has been transferred to the Middle division; T. J. Skillman, division engineer of the Camden Terminal and the West Jersey & Seashore Railroad, has been transferred to the Monongahela division; D. T. Easby, division engineer of the Allegheny division, has been transferred to the Camden Terminal and West Jersey & Seashore Railroad; effective April 15.

A. M. CURRIER, assistant engineer of the New York Central Lines West of Buffalo, with office at Cleveland, Ohio, has been appointed principal assistant engineer, with the same headquarters. He was born at Iowa City, Ia., on August 31, 1881, received his education at the University of Iowa, and entered railway service with the Chicago Transfer & Clearing Company in 1900. In 1902 he went with the Union Pacific, and in the following year he was employed in the engineering department of the Chicago, Burlington & Quincy. From 1905 to 1908, he served in various capacities in the engineering department of the Missouri Pacific, going from that road to the New York Central, where he has been employed ever since.

HAROLD KNIGHT, signal engineer for the Erie system with office at Jersey City, N. J., has been appointed assistant superintendent of maintenance with office at New York, effective May 1. Mr. Knight was born at Stockport, N. Y., in 1881, and received his education in the schools of Middletown, N. Y., and Sheffield Scientific school, Yale University, graduating with the class of 1904. He entered railway service in August, 1904, as chainman in the engineering department of the Erie at Elmira, N. Y., and in 1905 he was made assistant engineer at Hornell, N. Y. In 1908 he was promoted to division engineer of the Allegheny division with headquarters at Salamanca, N. Y., and in 1912 he was transferred to the New York division. In 1914 he was appointed signal engineer of the Erie system, which position he held at the time of his recent appointment.

GALEN B. OWEN, who has been appointed superintendent of maintenance of the Erie, with headquarters at New York, was born on July 31, 1860, and was educated at Towanda (Pa.) high school and institute. He began railway work on the Lehigh Valley in 1880, serving as a rodman until August, 1881, and then as assistant engineer until April, 1889. From April, 1889, to August, 1896, he was roadmaster and engineer of construction on the same road, and then to April, 1899, was division engineer maintenance of way, on the Baltimore & Ohio. In April, 1899, he was appointed superintendent of maintenance of way on the same road at Baltimore, Md., and from July, 1902, to April of the following year he was engineer maintenance of way of the West Virginia Central & Pittsburgh, now a part of the Western Maryland. On April 15, 1903, he was appointed assistant to the general manager of the Erie, and in May, 1907, he was appointed engineer maintenance of way on the same road. In 1913 he was granted a leave of absence and subsequently left railway service. He now returns to the service of the Erie as superintendent of maintenance, with headquarters at New York, as above noted.

E. F. MITCHELL, group engineer of the Western group of the Presidents' Conference Committee on Federal Valuation, has been appointed chief engineer of the Texas & Pacific, with headquarters at Dallas, Tex., succeeding C. H. Chamberlin, effective April 1. Mr. Mitchell was born in July, 1864, and was educated in private schools. He entered railway service in 1882 as an employee of the construction department of the Pennsylvania. He remained with this road in various capacities in the construction and maintenance departments until 1887. From that time to 1890 he was division engineer maintenance of way of the Norfolk & Western, and from 1890 to 1892 assistant engineer in charge of surveys and track construction and draftsman for the Denver & Rio Grande. He was then engaged in private civil and mining engineering practice in Colorado until 1900, when he returned to the Denver & Rio Grande as assistant engineer. From 1901 to 1904 he was chief engineer of the San Luis Valley Land & Mining Company in Colorado, and from 1905 to 1912 was engineer of construction and chief engineer of the Missouri Pacific. For the next four years he was engaged in private practice as consulting engineer until his appointment as group engineer of the Western group of the Presidents' Conference Committee on Federal Valuation.

TRACK

W. S. KING was appointed chief tie inspector of the Chesapeake & Ohio, with headquarters at Barbourville, W. Va., effective April 1.

A. B. RICHARDS, roadmaster on the Lake Erie & Western at Muncie, Ind., has been transferred to Tipton, Ind., succeeding A. J. Smith, promoted to superintendent at Muncie.

W. J. WHIPPLE, supervisor of track of the Chesapeake & Ohio, with office at Clifton Forge, Va., has been appointed general inspector of track, with headquarters at Richmond, Va., succeeding J. W. Meredith, deceased.

R. HUBER, general roadmaster of the Denver & Rio Grande, Utah lines, with office at Salt Lake City, Utah, has been appointed roadmaster of the Chicago, Burlington & Quincy at Brookfield, Mo., succeeding C. A. Nunes, transferred.

D. RUSHFORD, roadmaster on the Fourth district of the Denver & Rio Grande, with headquarters at Manti, Utah, has been transferred to the First district, with headquarters at Salt Lake City, Utah, succeeding M. J. Nelligan, transferred to Manti, effective April 1.

R. J. O'CONNOR, assistant roadmaster on the First district of the Spokane division of the Great Northern, with headquarters at Bonner's Ferry, Idaho, has been appointed acting division roadmaster of the Spokane division, with headquarters at Spokane, Wash., relieving F. C. Hanneman, granted leave of absence on account of illness. Iver Johnson has been appointed acting assistant roadmaster at Bonner's Ferry, succeeding Mr. O'Connor.

R. GARDNER, who has been acting roadmaster on the Creston division of the Chicago, Burlington & Quincy, with headquarters at Creston, Iowa, for several months, has been appointed roadmaster at this point. S. J. Sharpe, general foreman of the Galesburg, Ill., yard, has been promoted to the position of assistant roadmaster at Chicago, Ill., where he will be in charge of the construction of new track facilities. F. L. Tobin has been appointed general foreman at Galesburg, succeeding Mr. Sharpe. C. Dagen, extra gang foreman, has been appointed assistant roadmaster of the Beardstown division in charge of track work incident to the construction of second track.

THOMAS P. CULLIGAN, supervisor of track on the New York Central at Fonda, N. Y., has been transferred to West Albany, succeeding G. W. Eberhardt, transferred to a new subdivision, with headquarters at North Tonawanda, N. Y. F. W. Vincent, supervisor at Pawling, N. Y., has been transferred to Fonda, succeeding Mr. Culligan. Guy M. Smith, second assistant supervisor of track of West Albany, has been promoted to first assistant supervisor at the same point, succeeding Thomas Behan, transferred to a new subdivision at North Tonawanda, N. Y Francis Quinn has been promoted to second assistant supervisor of track at West Albany, succeeding Mr. Smith. John Donnelly has been appointed general foreman at Frankfort, N. Y., succeeding J. F. Peltier, promoted.

BRIDGE

VICTOR HANSEN has been appointed chief carpenter on the Iowa & Dakota division of the Chicago, Milwaukee & St. Paul, with office at Mason City, Ia., succeeding C. J. Hansen, resigned.

C. HENCH, master carpenter on the Pennsylvania Railroad at Sunbury, Pa., has been transferred to the Schuylkill division, with headquarters at Reading, Pa., succeeding J. S. Wallace, promoted.

PETER VANDANACKER has been appointed chief carpenter of the east end of the Hastings and Dakota division of the Chicago, Milwaukee & St. Paul, with headquarters at Minneapolis, Minn., succeeding W. H. MacArthur, resigned.

F. H. BUSBY, supervisor of bridges and buildings on the Omaha division of the Missouri Pacific, with headquarters at Atchison, Kan., has been transferred to Falls City, Neb., succeeding H. W. Clark, transferred to Atchison.

MORITZ J. KERNDT, bridge and building accountant of the Denver & Rio Grande, with office at Denver, Colo., has been appointed supervisor of bridges and buildings at Salida, Colo. He was born at Lansing, Ia., February 15, 1861, and completed his education at Hopkinton College, Hopkinton, Ia., in 1879. He entered railway service in March, 1897, as a laborer in the bridge yard of the Denver & Rio Grande at Salida, Colo. In October, 1899, he was promoted to bridge carpenter, and in 1901 was advanced to bridge and building clerk. He was appointed bridge and building accountant on January 1, 1917, which latter position he held up to the time his present appointment, as noted above, became effective. He succeeds James Vaughan, deceased.

E. B. BRINK, supervisor of bridges and buildings on the Rochester division of the New York Central, with office at Rochester, N. Y., has been appointed supervisor of bridges and buildings of the Lake Erie & Western, with headquarters at Tipton, Ind. He was born in Columbia County, Pa., in 1869, and completed his education through the International Correspondence Schools at Scranton, Pa. In 1893 he entered railway service with the New York Central, being assigned to bridge work on the Pennsylvania division. In 1906 he was transferred to new construction work on the Grand Central Terminal at New York City, where he remained until October, 1913, when he was appointed supervisor of bridges and buildings on the Rochester division of this same company. He now becomes, as noted before, supervisor of bridges and buildings, with jurisdiction over all divisions of the Lake Erie & Western, succeeding J. N. Penwell, resigned to accept service with another company.

OBITUARY

JUSTUS B. MOLL, who retired in 1909 as general roadmaster of the Chicago, Milwaukee & St. Paul, after 44 years of continuous service with this company, died at his home in Chicago, April 18, age 79 years.

JAMES BURKE, superintendent of the Chicago Terminal division of the Erie at Chicago, died at his home in that city of pneumonia on April 17. Mr. Burke was born at Oswego, N. Y., in 1856. He entered railway service with the Chicago, Milwaukee & St. Paul in 1873, was employed in the engineering corps of the Chicago & North Western between 1878 and 1879, was work train conductor and assistant roadmaster on the Atchison, Topeka & Santa Fe from 1880 to 1882 and division roadmaster on the Minneapolis & St. Louis from 1883 to 1886. The following three years he was division roadmaster of the Minneapolis, St. Paul & Sault Ste. Marie and between 1889 and 1893 was superintendent of construction for the same company. During the following five years he was general roadmaster of the Soo lines and in 1899 was appointed division engineer of the Baltimore & Ohio. He became connected with the Erie in 1902 as engineer maintenance of way at Cleveland, Ohio. He was later appointed superintendent of roadway, bridges and buildings, with headquarters at the same city, and in January, 1914, was appointed to the position he held at his death. He had been active in the Roadmasters' and Maintenance of Way Association for many years, being chairman of the Arrangements committee this year.

SAMUEL F. PATTERSON, secretary emeritus of the American Railway Bridge & Building Association, died at Chicago on April 17 of pneumonia after an illness of two days. Mr. Patterson was born at Hopkinson, N. H., on January 23, 1840. After serving in the Civil War as a private and later as a first lieutenant, he entered railway service with the Concord & Montreal Railroad, where he was in charge of bridge and building work on this road and its successor, the Boston & Maine, continuously for 45 years, until he retired a few years ago. He came before railway men most prominently through his long connection with the American Railway Bridge & Building Association, of which he was a pioneer member and of which he was its first secretary, serving for 17 years, until his retirement in 1909. It was largely through his efforts in guiding it during its early years that the association arrived at the strong position which it holds today. During recent years his home has been at Concord, N. H.

SAMUEL F. PATTERSON

CONSTRUCTION NEWS

THE ATLANTIC COAST LINE will build a new brick and stucco passenger station at De Land, Fla., as soon as the plans have been approved.

THE BUFFALO, ROCHESTER & PITTSBURGH expects to start work soon on the construction of a combined freight and passenger station at West Falls, N. Y., to replace one which was destroyed by fire.

This road has given a contract to the Westinghouse, Church, Kerr Company, New York, for improvements at East Salamanca, N. Y., to cost $500,000. This work includes the erection of machine and erecting shops, transfer table, blacksmith shop and storehouse. The offices will also be remodeled.

This road is preparing plans for new passenger and freight stations of brick construction at Mt. Jewett, Pa. The passenger station will be located on the site of the old one and the freight station just to the south of the passenger station. The general plans include the usual landscape gardening, and the work will cost in the neighborhood of $35,000.

THE CHICAGO, BURLINGTON & QUINCY will build about 24 miles of second track between Litchfield, Ill., and Virden, by company forces, during the present year, at an approximate cost of $375,000.

This road plans to spend $150,000 within the next few months to improve its terminal facilities at Beardstown, Ill. The plans include extensions to the present roundhouse, a few minor shop buildings and additional track facilities. The work will be done by company forces.

This road has started the construction of a reinforced concrete bridge over the Platte river, between Grand Island, Neb., and Phillips, with company forces. The bridge consists of four 20-ft. and twenty-six 25-ft. concrete slab spans and six 60-ft. deck plate girder spans, and will cost about $100,000.

THE CHICAGO & NORTH WESTERN has awarded contracts to Gaffin & Gehri, Fond du Lac, Wis., for the replacement of about 20 wooden bridges on the Wisconsin, Lake Shore, Ashland and Peninsula divisions with steel and concrete structures. Other contracts have also been awarded for similar work on other divisions.

This road also plans to build a large grain elevator at Council Bluffs, Ia., which will cost approximately $1,250,000. The structure will be of reinforced concrete, equipped with all modern conveniences for cleaning, drying and treating grain, and will have a capacity of 1,275,000 bushels. Several small buildings, including office, transformer house, shop, boiler house and dust house will also be erected, and 6½ miles of new track will be laid in the yards.

THE CITY OF PRINEVILLE is the name of a new steam road being constructed from Prineville, Ore., to Perrabonne, a distance of about 18½ miles. A contract for the grading has been awarded to E. T. Johnson & Sons, Portland, Ore., while the track laying and small bridges will be done by company forces. The grading will average 8,000 cu. yd. per mile, the maximum grade will be 2½ per cent and the maximum curve 10 deg. The road is expected to be in operation by September 1, 1917.

THE DICKINSON & NORTHWESTERN has been incorporated in North Dakota for the construction of a new railroad extending north and west of Dickinson, a distance of about 40 miles. W. L. Richards, Dickinson, N. D., is one of the incorporators.

THE ERIE has awarded contracts to the Peckham Construction Company for the superstructure, and to the Eastern Concrete Steel Company for the substructure of a steel viaduct, to be built at Louisiana street, Buffalo, N. Y., to eliminate a grade crossing at that point.

THE GREEN BAY & EASTERN has been granted a certificate of public convenience and necessity by the Railroad Commission of Wisconsin to construct a line from Green Bay, Wis., to Sheboygan, a distance of about 80 miles. Surveys have already been completed, and contracts for the grading will be let soon.

THE GULF COAST LINES are making plans to build a freight and passenger terminal at Beaumont, Tex., property valued at $75,000 having been purchased within the past few weeks. It is expected to begin work as soon as the plans have been approved.

THE ILLINOIS CENTRAL will construct a new water station at Princeton, Ky., involving a storage reservoir having a capacity of 168,000,000 gal., the reservoir to be formed by the construction of an earth dam with a concrete core wall and a spillway. A contract has been let to the Railway Water and Coal Handling Co., Chicago, for two Demming triplex pumps operated by two 40 hp. Crescent oil engines with a capacity of 1,000,000 gal. in 24 hrs. The pumping machinery will be housed in a brick pumphouse with a slate roof. The project will also involve three miles of 10 in. cast iron pipe line and tanks having a storage capacity of 300,000 gal.

This road also contemplates the construction of a viaduct just north of the passenger depot at McComb, Miss.

THE LOUISIANA & PINE BLUFF is making preliminary surveys for an extension from Dollar Junction, Ark., northeasterly about 33 miles to Calion, on the Chicago, Rock Island & Pacific. Contracts for the grading and bridging will probably be awarded about July 1.

THE MANNING, MANDAN & FREDA has been organized to build a steam road in North Dakota connecting Manning and intermediate points with Freda, a distance of about 136 miles. The plans provide for junctions with the Northern Pacific at Mandan and with the Chicago, Milwaukee & St. Paul at Freda, and also with a possible spur across the new bridge at Bismarck to connect with the Minneapolis, St. Paul & Sault Ste. Marie at that point. No contracts have yet been awarded.

THE MISSISSIPPI & WESTERN is building a line from Stevens, Miss., on the Gulf, Mobile & Northern to Fouke, a distance of 12 miles, and it is expected that the line will be completed and in operation by May. It is also planned to build an extension from Fouke to Vossburg, a distance of 18 miles, where a connection will be made with the New Orleans & Northeastern. The line is being built to carry lumber and merchandise.

THE NEW YORK CENTRAL has awarded a contract to G. L. Beebe, Utica, N. Y., to build a 90-ft., five-stall brick roundhouse, with a machine shop at one end, 12 ft. wide in front, 56 ft. wide in the rear and 62 ft. long.

This road has let a contract to the Crown Bar Construction Company to construct a viaduct across its Harlem division and the valley of the Bronx river at Mount Vernon, N. Y., at an estimated cost of $90,000. It is also planned to build a passenger station at this point.

This road and the Interborough Rapid Transit Company jointly have secured approval of the New York Public Service Commission, First District, for their plans and specifications for the construction of a station in the Bronx, New York, which will cost $32,067.

This road, the New York, Chicago & St. Louis and the East Erie Commercial Railroad will jointly build a subway at Water street, Wesleyville, Pa., which will cost about $300,000. It will have a headroom of from 14 ft. to 16 ft., will be 90 ft. wide and will provide for a double-track street railway and a single-track freight line.

THE NORTH GEORGIA MINERAL has received a charter from the state of Georgia and has an authorized capital of $1,250,000 to build a line 50 miles long from Atlanta northwest to a point near Catersville, running through Fulton, Cobb, Cherokee and Bartow counties. The corporation is regarded as a subsidiary of the Louisville & Nashville.

THE NORTHERN PACIFIC has outhorized the building of a branch line between Cowiche, Wash., and Tieton City, a distance of about 6½ miles, at an estimated cost of $224,271.

THE NORFOLK & WESTERN has awarded a contract to John P. Pettyjohn & Co. to build at Roanoke, Va., a brick and steel freight house, 740 ft. by 50 ft. and one story high; a brick freight office building, 140 ft. by 50 ft. and one story high with basement; two covered transfer platforms, 18 ft. by 800 ft., and two 18 ft. by 350 ft., additional storage tracks and paved driveways, with sheds over the team and track delivery sides. The buildings will be of semi-fireproof construction.

THE PENNSYLVANIA LINES WEST will raise their bridge over the Allegheny river at Pittsburgh, Pa., to comply with an order of the War Department.

This road is completing negotiations for their entry into Detroit, Mich. They will probably call for bids for the masonry and grading from Carleton to Detroit in about 60 days. The grading will be very light and no large bridges are to be built.

THE PENNSYLVANIA RAILROAD will build a freight station at Hazleton, Pa., which will be one story high, 37 ft. by 160 ft., with concrete foundations, brick walls, concrete floor, rolling steel doors and a built-up roof.

This road has received bids for the construction of a two-story brick passenger station at Frederick, Md., which will cost approximately $14,000. The building will be 21 ft. 6 in. wide and 85 ft. 3 in. long. It is planned to commence the work about May 1.

This road plans to build a combination freight house and office building at New Brunswick, N. J. The freight station is to be one story high, 40 ft. by 260 ft., and will have concrete foundations and brick walls. A second story, 40 ft. by 49 ft., will be built at one end of the freight station for office use.

This road announces that $3,500,000 is to be spent in the construction of a new grain elevator at Canton, Baltimore. The company also has plans prepared for the expenditure of $14,000,000 on improvements in that city, including tunnels to make a four-track line through the city, which are delayed until the city of Baltimore passes the necessary ordinances.

THE PHILADELPHIA & READING will start work soon on improvements at Rutherford, Pa., to include a 100-ft. turntable and extensions to the powerhouse. Additional stalls to the enginehouse will also be built and alterations made to the machine shop.

THE RED RIVER & GULF has awarded contracts to Irvin McGinnis, Alexandria, La., and J. Moore & Son for grading work on an extension from Long Leaf, La., northwesterly to Hornbeck on the Kansas City Southern, a distance of about 65 miles. All the other work on the line will be done by company forces. The maximum grade will be 1 per cent and the maximum curvature 3 deg. The grading averages about 17,000 cu. yd. to the mile. The company plans to develop a traffic in lumber, logs, farm produces and merchandise.

THE SOUTH DAKOTA SHORT LINE is the name of a new steam line which will be constructed from Platte, S. D., to Pierre, a distance of about 125 miles. It is expected to build a 25-mile section at once on which the grading will average 20,000 cu. yd. to the mile.

THE SOUTHERN plans to begin construction work as soon as contracts have been let on new freight yards and engine terminals at Selma, N. C. The new facilities include six yard tracks, each of 100 cars capacity; a 300-ton steel mechanical coal handling plant, serving one engine track and the main line; two cinder conveyors; engine storage, standing and approach tracks; repair tracks for 34 cars, with paint, carpenter and blacksmith shops; water and compressed air facilities; pens for watering and feeding stock in transit, and new track scales.

This road has awarded contracts for grading for double track on 71.5 miles between Charlotte, N. C., and Mt. Zion, S. C. This is the only part of the line not already in service or under construction as double track between Washington, D. C., and Atlanta, Ga., a distance of 649 miles. Double track is now in service on 477.5 miles, construction is under way on 100 miles and the remaining 71.5 miles will soon be constructed. Contracts were awarded to Robert Russel, Charlotte, N. C., for the section from Charlotte to Belmont, a distance of 10.9 miles; to the Crawford-Morrow Company, Atlanta, Ga., from Belmont to Bessemer City, 16.9 miles; to C. W. Lane & Co., Atlanta, from Bessemer City to Blacksburg, 18 miles; to the Brooks-Callaway Company, Atlanta, from Blacksburg to Gaffney, 9.6 miles, and from Cowpens to Mt. Zion, 5.8 miles, and to the Dunnavant & Gunter Company, Knoxville, Tenn., from Gaffney to Cowpens, a distance of 10.4 miles. On the Charlotte-Belmont section grading for double track has been completed on 1.9 miles north of Belmont, which includes the approaches to the new bridge over the Catawba river. Only single track has been placed on the bridge, which is now in service, although the masonry was constructed for double track.

THE SPOKANE & INLAND EMPIRE has awarded a contract to Porter Bros., Spokane, Wash., to construct a bridge at Bonner's Ferry, Idaho, which will cost $35,000.

THE TRINITY & BRAZOS VALLEY, through a subsidiary organization, has awarded contracts for the grading and bridging for a new line from Dayton, Texas, through Mt. Bellview into the Goose Creek oil fields, a distance of 23 miles. The grading will average 7,500 cu. yd. to the mile; the maximum grade will be 0.3 per cent and the maximum curve 2 deg. There will be about 30 wooden bridges. A depot and other terminal facilities will be built at Goose Creek. This new line will be practically an extension of the Trinity & Brazos Valley, officers of which are the incorporators of the new road.

THE UNION PACIFIC has made plans to fill four pile trestles between Starbuck, Wash., and Pendleton, Ore., this summer, the work to be done by company forces. About 540,000 cu. yd. of earth will be required.

THE UTAH RAILWAY will make improvements at Provo, Utah, within the next few months, which will include a steel water tank, a four-stall enginehouse, a cinder pit, a 200-ton coal bin and a 100-ft. turntable. These improvements will cost about $75,000.

THE YAZOO & MISSISSIPPI VALLEY plans soon to build an extension to its passenger station at Baton Rouge, La., with company forces. They will also construct mechanical facilities, including a coal chute, an eight-stall roundhouse, a storehouse and several other small buildings. These improvements will cost about $35,000.

This road, jointly with the Missouri & North Arkansas, has awarded a contract to the Leyden-Ortseifen Company, Chicago, Ill., to construct separate passenger and freight stations at Helena, Ark. The structures will be of concrete, brick and stone, with tile roofs. The passenger station will be 41 ft. by 96 ft. and two stories high, while the freight building will be 41 ft. by 282 ft. and one story high. The cost is estimated at $60,000. It is planned to commence work about May 1.

TRACK MATERIALS

THE ANN ARBOR has issued an inquiry for 3,000 tons of steel rails for 1918 delivery.

THE ILLINOIS CENTRAL has placed an order with the Sellers Manufacturing Company, Chicago, for 25,000 tons of tie plates. Delivery is to be extended over 18 months, beginning July 1, 1917.

THE PHILADELPHIA & READING is reported as having placed orders for 900,000 tie plates.

STRUCTURAL STEEL

THE BALTIMORE & OHIO has ordered 650 tons of steel from the Fort Pitt Bridge Works.

THE CHESAPEAKE & OHIO has ordered 200 tons of bridge steel from the American Bridge Company and 600 tons from an independent shop.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 200 tons of bridge steel from the Fort Pitt Bridge Works.

THE ILLINOIS CENTRAL has ordered 171 tons of steel from the American Bridge Company for a bridge over the Des Plaines River at Broadway, Ill., 269 tons from the same company for I-beams and other material for repairs to the Yazoo river bridge, and 110 tons for the Walnut street subway at Bloomington, Ill.

THE LEHIGH VALLEY has ordered 150 tons of steel for two roundhouses from the Kellogg Structural Steel Company, Buffalo.

THE NEW YORK CENTRAL has ordered 700 tons of steel from L. F. Shoemaker & Co., and 800 tons from other companies for grade crossing elimination work.

THE NORFOLK & WESTERN has ordered 200 tons of bridge steel.

THE PENNSYLVANIA RAILROAD has ordered 1,000 tons of bridge steel from the Phoenix Bridge Company for a bridge at Manayunk, Pa.

SUPPLY TRADE NEWS

PERSONAL

B. JOHN BUELL, formerly with the Spencer Otis Company, Chicago, has been appointed general manager of the Reading Specialties Company, Reading, Pa.

J. A. MEADEN, vice-president of Paul Dickinson, Inc., Chicago, has resigned to become sales manager of the Automatic Screw Machine Products Company, Chicago.

HENRY SCHOONMAKER, secretary of the American Bridge Company, with which he had been connected since its formation, died from pneumonia, in Brooklyn, N. Y., on April 9, aged 61 years.

J. N. PENWELL, supervisor of bridges and buildings of the Lake Erie & Western, with office at Indianapolis, Ind., has resigned to become connected with the Ogle Construction Company, Chicago, Ill.

H. F. BIGLER, JR., of the A. M. Byers Company, has been transferred to the railway department at Pittsburgh, Pa., and from now will devote his time exclusively to railway work, assisting S. P. Broome.

G. A. COOPER of the copy service department of the Simmons-Boardman Publishing Company, Chicago, has been appointed a representative in the railroad department of the United States Graphite Company, with headquarters at Chicago.

R. S. CHARLES, formerly engineer maintenance of way of the Wabash at Montpelier, Ohio, has resigned to become associated with the Layne & Bowler Company, Memphis, Tenn., water supply contractors. He will have charge of all field operations, the development of ground water supplies and the installation of pumping machinery for irrigation and industrial purposes.

W. J. KELLEHER, purchasing agent of the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific, with headquarters at New Orleans, La., has resigned, effective May 1, to assume a position as general manager with the Southern Creosoting Company at Slidell, La. He was born at Cincinnati, Ohio, October 2, 1871, and entered railway service June 20, 1884, as office boy to the superintendent of bridges and buildings of the St. Louis, Iron Mountain & Southern at Little Rock, Ark. From 1887 to 1890 he was first a messenger and then stenographer to the superintendent of bridges and buildings of the Wabash at Springfield, Ill. From March, 1890, and up to January, 1896, he was a stenographer to the superintendent of the New Orleans & Northeastern at New Orleans and from January, 1896, to November, 1905, he was chief clerk in the office of the president and general manager of this same road, and also of the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific. On November 1, 1905, he was appointed purchasing agent of these three roads, which position he will continue to fill up to the time his resignation becomes effective.

GENERAL

THE AUTOMATIC RAILWAY CROSSING GUARD COMPANY, Broken Arrow, Okla., has been incorporated with an authorized capitalization of $200,000, to manufacture cattle guards.

THE UNITED STATES STEEL CORPORATION announced on March 3, through Elbert H. Gary, chairman of the board, that all employees of its subsidiary companies receiving less than $2,500 a year would receive an increase in pay of ten per cent, effective May 1. This is the fourth advance of ten per cent since the first of 1916, making a total increase of more than 46 per cent compounded.

ROBERT W. HUNT & CO. has offered the services of its entire bureau of inspection, tests and consultation to the government at actual cost, in a letter to the secretary of war dated April 20. This includes all of the 700 employees in the main office at Chicago and in the branch offices and laboratories in New York City, Pittsburgh, St. Louis, San Francisco, Montreal and London. This offer is made in the belief that this large and highly specialized organization can be of service to the country in a particularly practical manner at less cost to the country than equivalent services can be obtained otherwise. The acceptance of this proposal will relieve government officers from inspection duties for services of greater value in other directions and will enable the government to utilize this organization intact without the necessity of gathering together other men into a similar organization which it would take time to develop. In addition to its work for many of the railways and other large private corporations, this company is now and has been performing inspection work for the British, Russian, Italian, Netherland and French governments, not only on munition orders, but also on steel rails and their fastenings and other railway equipment.

THE UNITED STATES CIRCUIT COURT OF APPEALS for the Seventh Circuit rendered a decision on April 10, holding that the Ajax rail anchor infringed on the Kramer patents of the P. & M. Company. This decision was rendered on an appeal from a ruling of the District Court of the Northern District of Illinois, Eastern Division, dismissing the suit for infringement brought by the P. & M. Company against the Ajax Rail Anchor Company. The P. & M. Company maintained that the Elfborg patents, under which the Ajax rail anchor was being made, infringed on the Kramer patent issued in 1912. The recent decision of the Circuit Court of Appeals stated that the fundamental features of the Kramer patent are employed in the Ajax anchor in order to obtain the same objects and that the material reduction in the amount of metal required in the Ajax anchor does not save it from the charge of infringement.

THE UNITED STATES CIRCUIT COURT OF APPEALS for the Seventh Circuit handed down a decision at Chicago, on April 10, on an appeal of the Track Specialties Company from a decision of the District Court for the Northern District of Illinois, Eastern Division, enjoining the manufacture, sale and use of the Superior rail anchor, affirming the decision of the lower court. The suit was brought by Otto R. Barnett against the Track Specialties Company and involved the infringement of certain claims in the patent for rail anchors issued to John L. Pope on August 21, 1900, to Edward Lass and Hiram H. Sponenburg, on February 10, 1903, and to David F. and David L. Vaughan on March 26, 1912, by the anchor shown in a patent issued to John A. Bodkin on January 16, 1912. The District Court held that the Bodkin patent infringed the claims of the three other patents and the Circuit Court affirmed this decision.

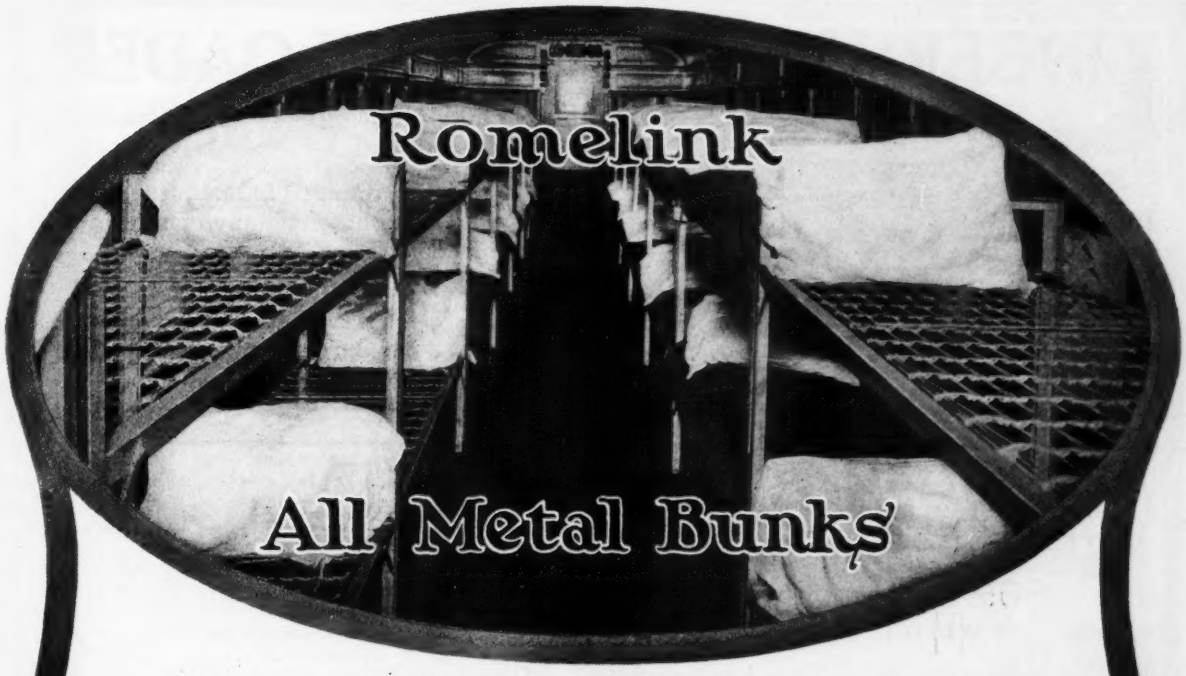
TRADE PUBLICATIONS

WROUGHT IRON PIPE.—The A. M. Byers Company, Pittsburg, Pa., recently issued Bulletin No. 27, which contains reprints of letters from users of their products.

HEAVY CAPACITY SCALE.—The Toledo Scale Company, Toledo, Ohio, has issued an eight-page leaflet describing the special features of the new Toledo automatic springless scale. It is an example of a technical exposition put in an interesting form and is made clear by the clever use of well selevted explanatory drawings.

CLAY PIPE BOOK.—The International Clay Products Bureau, Kansas City, Mo., has issued a 41-page booklet describing vitrified salt glazed sanitary sewer pipe. It also contains a concise compilation of data on the design and construction of sanitary sewers, drainage systems and culverts. The book is illustrated with interesting photographs relative to the manufacture and use of this product.

CREOSOTE OIL.—The Barrett Company, New York, has issued a 14-page booklet with the sub-title, "Where and How to Use Barrett Carbosota Grade 1, Liquid Creosote Oil." The booklet is illustrated with views showing decay in various structures where untreated wood was used in contact with the ground or with concrete, brick or masonry. Two pages are devoted to a description and a detailed plan of a simple and inexpensive wood-treating plant, and several pages to the various uses and application of creosote oil, together with the directions for using.



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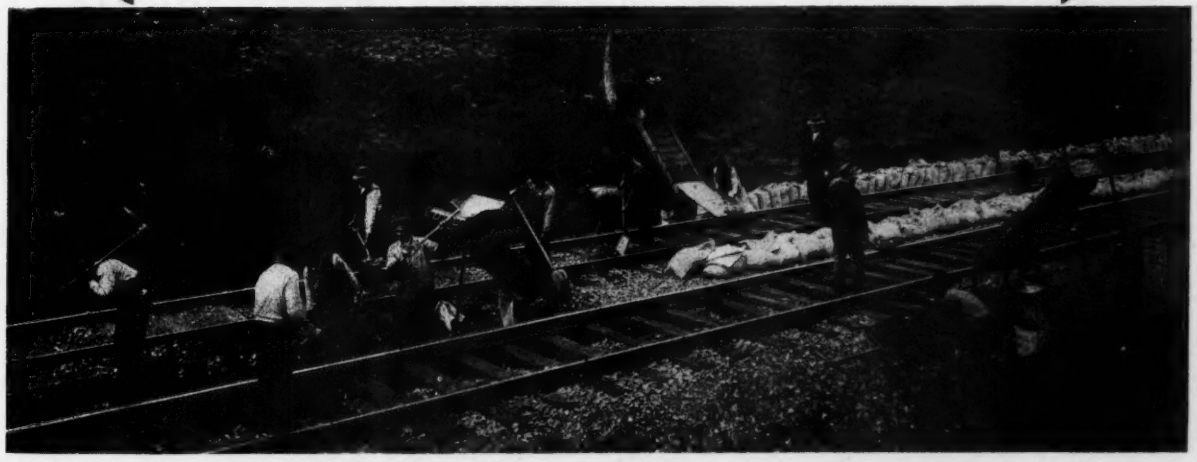

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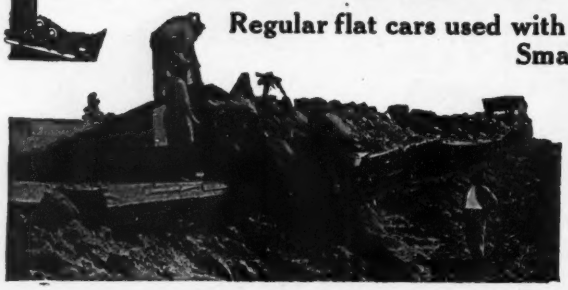

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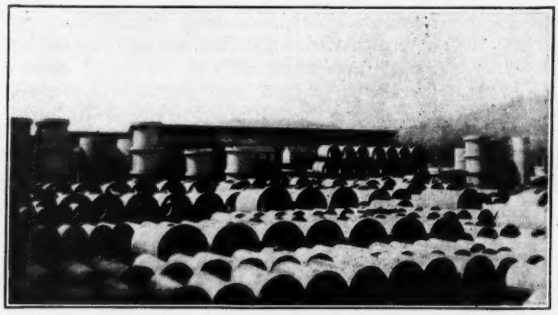

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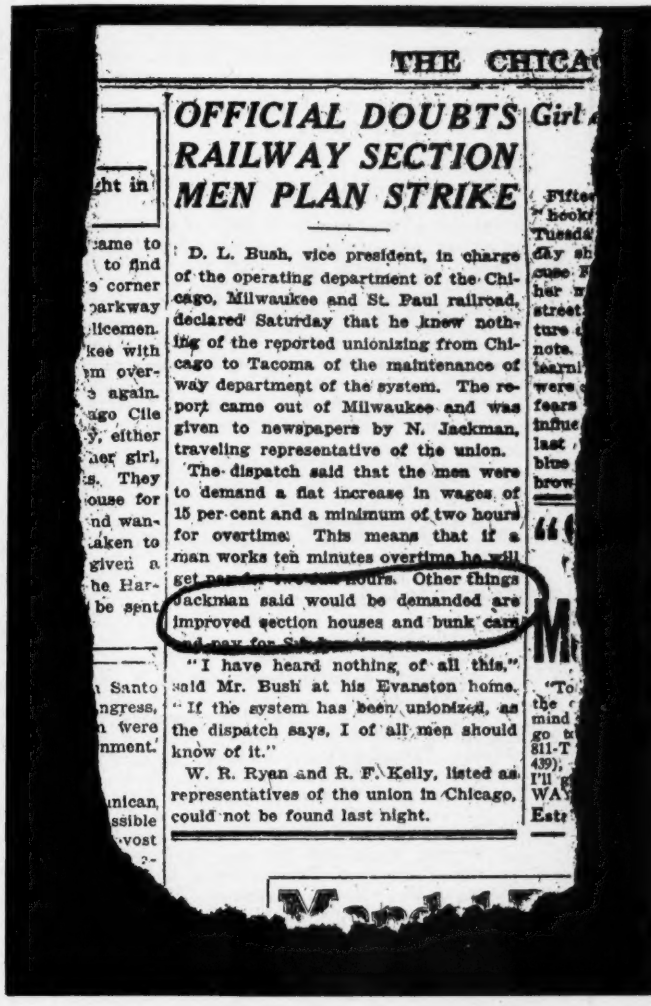


THE CHICA

OFFICIAL DOUBTS RAILWAY SECTION MEN PLAN STRIKE

D. L. Bush, vice president, in charge of the operating department of the Chicago, Milwaukee and St. Paul railroad, declared Saturday that he knew nothing of the reported unionizing from Chicago to Tacoma of the maintenance of way department of the system. The report came out of Milwaukee and was given to newspapers by N. Jackman, traveling representative of the union.

The dispatch said that the men were to demand a flat increase in wages of 15 per cent and a minimum of two hours for overtime. This means that if a man works ten minutes overtime he will get pay for two hours. Other things Jackman said would be demanded are improved section houses and bunk cars

"I have heard nothing of all this," said Mr. Bush at his Evanston home. "If the system has been unionized, as the dispatch says, I of all men should know of it."

W. R. Ryan and R. F. Kelly, listed as representatives of the union in Chicago, could not be found last night.

They Object to This Condition

Truscon STEEL BUILDINGS

PORTABLE PERMANENT

Here is the Solution of the Problem

Truscon Buildings Answer the Demand

The objections of section gangs and construction crews to unsanitary quarters in condemned box cars can be most economically met with Truscon Steel Buildings, because they are very easy to erect, and to "knock down" for transporting. A hammer is the only tool needed. They can be flushed out with water and kept absolutely clean. With Truscon section houses and bunk houses you will never hear objections from your men, and they will be more fit for work. It pays to supply laborers with clean, well-ventilated quarters.

Truscon Steel Buildings are both portable and permanent. They can be "knocked down" and erected any number of times. They are fireproof, vermin-proof and sanitary. They do not depreciate in being taken down. No expense for maintenance.

Send for the "Truscon" Book

KAHN Building Products

Trussed Concrete Steel Company

Representatives in Principal Cities **Railroad Department, Youngstown, Ohio**

KAHN Building Products

Why ?

Why have America's leading Railroads year after year specified BARRETT Track Jacks?

And why does the total number of Barrett Jacks placed with the steam and street railways of Europe and America run into the millions?

Because they are designed by the world's most accomplished jack engineers, in the most comprehensive jack engineering department in existence.

Because they are built of especially determined materials, and manufactured and assembled by skilled workmen.

Because, due to their scientific construction, they operate with utmost ease, yet with maximum speed.

Because their maintenance cost is negligible.

Because there are over seventeen different styles of Track Jacks and sizes to select from—the largest assortment made by any one manufacturer.

Because Barrett engineers design special jacks for individual conditions.

There are other reasons far too numerous to mention here. They will be found in a special 150-page illustrated catalog. Send for your copy today.

THE DUFF MFG. CO.

Established 1883 PITTSBURGH, PA.

New York Chicago Atlanta

STATEMENT of the ownership, management, etc., required by the Act of Congress of August 24, 1912, of the *Railway Maintenance Engineer*, published monthly at Chicago, Ill., for April 1, 1917.

State of New York } ss.
County of New York }

Before me, a notary public in and for the State and County aforesaid, personally appeared Edward A. Simmons, who having been duly sworn according to law, deposes and says that he is the President of the *Railway Maintenance Engineer*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Simmons-Boardman Publishing Co., Woolworth Building, New York, N. Y.
Editor, Elmer T. Howson, Transportation Building, Chicago, Ill.
Managing Editor, none.
Business Managers, none.

2. That the owners are:
Owner — Simmons-Boardman Publishing Co., Woolworth Building, New York, N. Y. Stockholders holding 1 per cent or more of total amount of stock: Edward A. Simmons, Woolworth Building, New York; Lucius B. Sherman, Transportation Building, Chicago, Ill.; Henry Lee, Woolworth Building, New York; Henry Lee, Woolworth Building, New York (Trustee for Thos. Prosser); Samuel O. Dunn, Transportation Building, Chicago, Ill.; Roy V. Wright, Woolworth Building, New York; Elmer T. Howson, Transportation Building, Chicago, Ill.; H. H. Simmons, Transportation Building, Chicago, Ill.; Ida R. Simmons, 1625 Ditmas Ave., Brooklyn, N. Y.; Bradford Boardman, 203 W. 40th St., New York; Francis Boardman, Riverdale, N. Y.; A. C. Boardman, Riverdale, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: Clara Boardman Peck, 776 Lexington Ave., New York, N. Y., and Henrietta F. H. Boardman, 103 East 86th St., New York, N. Y.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDWARD A. SIMMONS.

[SEAL]

Sworn to and subscribed before me this 2nd day of April, 1917.

G. H. RAYMOND.

Notary Public, Kings County, No. 50; Certificate filed New York County No. 102; New York Register No. 8113; Commission expires March 30, 1918.

CREOSOTE OILS

Maintenance of Way Oil No. 1

Maintenance of Way Oil No. 2

Maintenance of Way Oil No. 3

REILLY IMPROVED CREOSOTE OIL

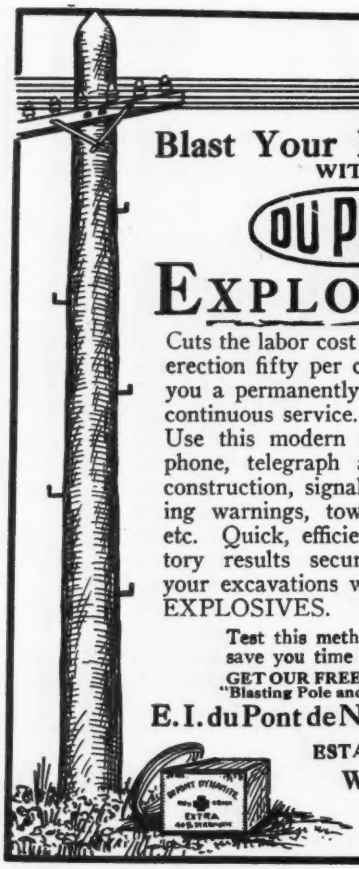
Advise us of your requirements

REPUBLIC CREOSOTING COMPANY

1614 Merchants Bank Building
Indianapolis, Indiana

PLANTS

Indianapolis Minneapolis Mobile Seattle



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WITH
DU PONT
EXPLOSIVES

Cuts the labor cost of pole and post erection fifty per cent, and insures you a permanently secure line and continuous service.
Use this modern method in telephone, telegraph and power line construction, signal systems, crossing warnings, tower foundations, etc. Quick, efficient and satisfactory results secured by blasting your excavations with DU PONT EXPLOSIVES.

Test this method. It will save you time and money.
GET OUR FREE BOOKLET: "Blasting Pole and Post Holes."

E. I. du Pont de Nemours & Co.
ESTABLISHED 1802
Wilmington, Delaware

SHERWIN-WILLIAMS

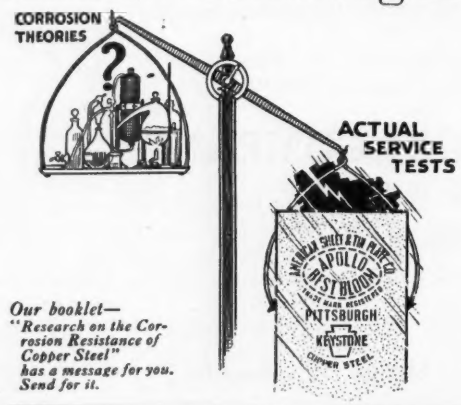
Visual Red

FOR CABOOSES AND SEMAPHORE BLADES

Permanent—Solid Covering—Sharp and Bright—Visible at Long Distance

THE SHERWIN-WILLIAMS CO.
Railway Paint and Varnish Makers
Address inquiries to
798 Canal Road, N. W. CLEVELAND, OHIO

The final test of *quality* is service—actual and continued. This is the overbalancing and unanswerable argument for APOLLO—*it lasts.*



Our booklet— "Research on the Corrosion Resistance of Copper Steel" has a message for you. Send for it.

KEYSTONE Copper Steel
FOR CULVERTS

has proved its superior rust-resistance by actual time and service tests. APOLLO-KEYSTONE Galvanized is also unequaled for Flumes, Tanks, Roofing, Siding, and all forms of exposed sheet metal work.

American Sheet and Tin Plate Company
GENERAL OFFICES: Frick Building, PITTSBURGH, PA.
DISTRICT SALES OFFICES:
Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis
Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, New York City
Pacific Coast Representatives: UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

A "Gunite" Transformation

The Station Which Was Born Again

LOOK at this time worn old railroad station, this relic of the "jig saw age," which, as far as conditions are concerned, is a good prototype of many a one along the lines of American railroads. This frame building which when constructed was considered "a thing of beauty," but which has certainly not proved "a joy forever." Poor, shabby, unsanitary, inconvenient old station, it looks as if you had outlived your usefulness and must be torn down.

Look at this "smart," modern concrete building which has replaced it—this station which is a comfort to patrons, a credit to the railroad, and which adds an up-to-date air to its surroundings. Note its clean cut, solid appearance. It is an attractive modern station building, is it not?

You say "You knew that old station would be torn down to make way for the march of improvement." That is where you are mistaken, *for this is the same old building, transformed, reborn and brought to useful life again through means of the*

CEMENT-GUN and its product GUNITE

"Wonderful!" Not at all; simple and most inexpensive, labor. Material and all other costs, $211.48, or in other words, 264 square yardage at a cost of 80 cents per sq. yd. No wonder the railroads appreciate the savings and safety secured by

A Cement-Gun for Every Division

Look at these two pictures. Does not the economical transformation of this time worn station into a modern concrete building suggest to you the improvements and savings the Cement-Gun will insure for that road of yours, by assuring greater ease, rapidity, safety and much *lower* cost for those cement jobs which are constantly cropping up?

Remember the Cement-Gun can be purchased outright from us and used by any one, as it is not a restricted article.

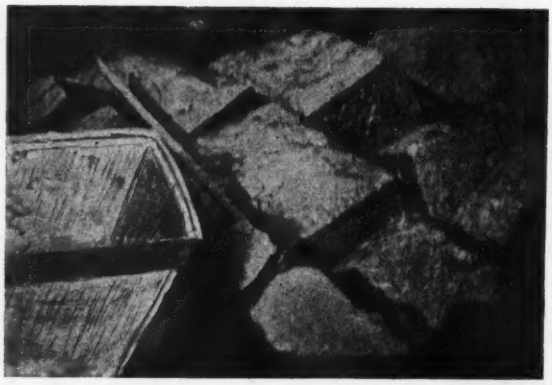
The Cement-Gun is the gun of General Utility in the railroad field, and its adoption results in marked decrease in maintenance costs. Shall we not send you the complete facts?

CEMENT-GUN COMPANY, Inc. Allentown, Pa.

New York Office, 30 Church Street

Byers & Ayers, 1414 Fisher Bldg., Chicago, Ills.
John A. Traylor, Newhouse Bldg., Salt Lake City, Utah
Taylor Engineering Co., 538 Central Bldg., Seattle, Washington
Taylor Engineering Co., Vancouver, B. C.
A. R. Roberts, 727 Traders Bank Bldg., Toronto, Ont., Canada

Steel for Service



Bed of Rocks Penetrated by United States Steel Sheet Piling.

Extract from letter from Wiley & Remick, Contractors on the Stillwell Pier, Muskingum River, Ohio:

"If we had known the actual conditions we would not have thought of driving steel until a diver had removed the wreckage, but as it was under 8 feet of water and impossible to see it, we went ahead with the driving. * * *

"A number of the largest stones were cut in two by the steel. * * *

"Of the 106 pieces used in the cofferdam, only 2 pieces were damaged."

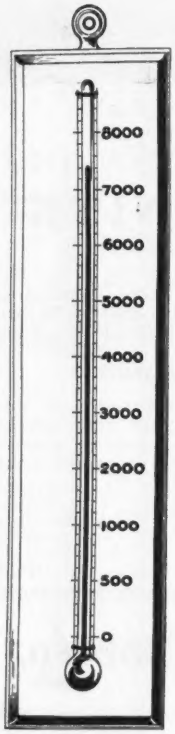
United States Steel Sheet Piling

was used on this job. Ask for pamphlet—Steel Sheet Piling—from nearest district office.

Carnegie Steel Company

General Offices—Pittsburgh, Pa.

807



Watch It Climb!

Going Up!

THE figures on the scale correspond with the number of paid subscribers to the *Railway Maintenance Engineer*. When the 8,000 mark will have been reached the rates for advertising will be advanced approximately 25 per cent. The schedule now in force was based on an initial circulation of 4,000 copies a month.

As the *Railway Maintenance Engineer* goes to the very class of men who have to do with specifying and buying those things over which the maintenance of way department has absolute control, the use of its pages is essential to any sales campaign. The names of more than 80 per cent of them cannot be found in any printed list nor on any office mailing list. Better contract for space and service now and protect yourself against the rising market.

Purchases of maintenance of way materials are being made at the rate of more than $1,500,000 a day!

Railway Maintenance Engineer

New York Woolworth Bldg. **Chicago** Transportation Bldg. **Cleveland** Citizens Bldg. **Washington** Home Life Bldg.

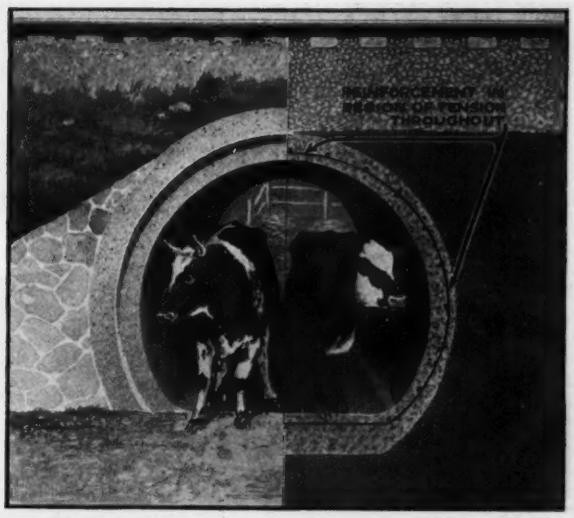
The Railway Maintenance Engineer is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.)

Massey Concrete Cattle Pass

Here's a point of superiority you engineers will recognize—only in the Massey cattle pass is the reinforcing placed in the region of tension throughout. The cross-section illustrates this big advantage. The strength it adds should be considered when you are contemplating the installation of cattle passes.

The Massey cattle pass is made up at our factories in units 6' long, 84" wide by 72" high inside. Two head of cattle pass through side by side. A flat bottom gives them broader footing.

The Massey pass is built to carry the dead load in deep fills, and live loads when placed within about 3' of the base of the rail. It is more economical than any other type of structure, and requires absolutely no maintenance.



Massey factories make concrete culvert pipe, 12" to 84" in diameter, concrete bridge slabs, piles, and portable concrete houses. Our plant locations and large stock of standard products enable us to make prompt deliveries at low freight rates.

Get Massey Service with Your Cattle Pass

C. F. MASSEY COMPANY

NEW YORK
NORFOLK
KANSAS CITY
Peoples Gas Building
CHICAGO
MINNEAPOLIS
SPOKANE
DALLAS

Factories Located at

Newark, N. J.
Chicago, Ill.
Memphis, Tenn.
Anna, Ill.
Kansas City, Mo.
Meridian, Miss.
Minneapolis, Minn.
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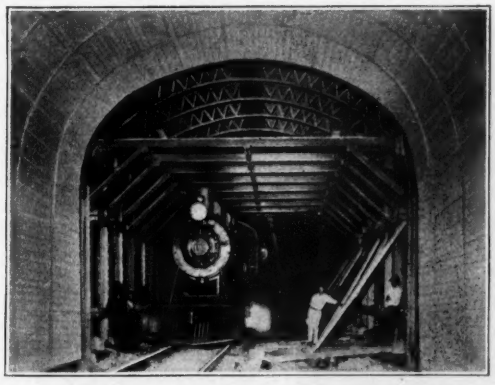
Chatham, Ont., Can.



RAPID WORK—LOWER COST BETTER RESULTS AND NO DELAY IN TRAFFIC

These are some of the advantages secured by railroads that line tunnels by the

Pneumatic Method of Mixing and Conveying Concrete
(Patented)

Labor cost and time are reduced to one-third. Less equipment is required—No other mixer, no cars, no tracks, no elevated platforms, no locomotives.

Tests of small blocks taken at random from the Wilson Avenue Tunnel, Chicago, for testing, proved not alone their exceeding density, but in many cases proved so hard that the equipment of the Underwriters' Laboratory could not crush them.

Used by C. B. & Q. and other leading roads. They secure better work at half the cost of other methods.

We lease equipment, or do work on contract.
Send for descriptive literature.

CONCRETE MIXING & PLACING CO.
123 W. Madison St. - - CHICAGO

STONE BALLAST CLEANING

Can be done and is being done on some of the best railroads in the country at a saving of 56% by the use of the

TRENCH-ZEPP STONE BALLAST CLEANER

Such economy well deserves your investigation.

Write for booklet of cuts and a copy of the latest report on Stone Ballast Cleaning by this new method.

LITTLEFORD BROS.
MANUFACTURERS CINCINNATI, OHIO SOLE AGENTS

The Car Which LIGHTENS THE COST OF Maintenance Work

THE CAR OF SERVICE

THE CAR OF SAVING

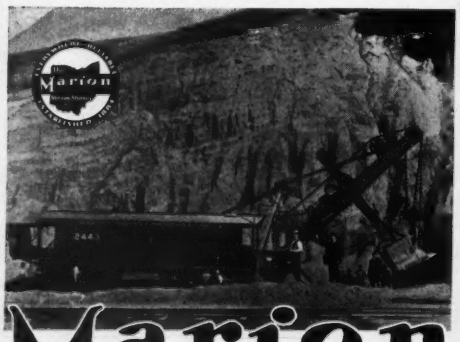
THE WESTERN AIR DUMP CAR

The Car of Economy
In Ditching and Trestle Filling

The car which makes short work train schedules possible

SEND FOR CATALOG

WESTERN WHEELED SCRAPER CO.
AURORA ILLINOIS



Marion

Steam Shovels, Dredges, Draglines and Kindred Machinery

WHEN gravel or other ballasting material is to be produced by the trainload, and moved away from the pit on regular schedule, the loading equipment *must be bigger than its job*. And that's just what the Oregon-Washington Railway & Navigation Company, and many other prominent Transportation Systems, have found Marion Shovels to be.

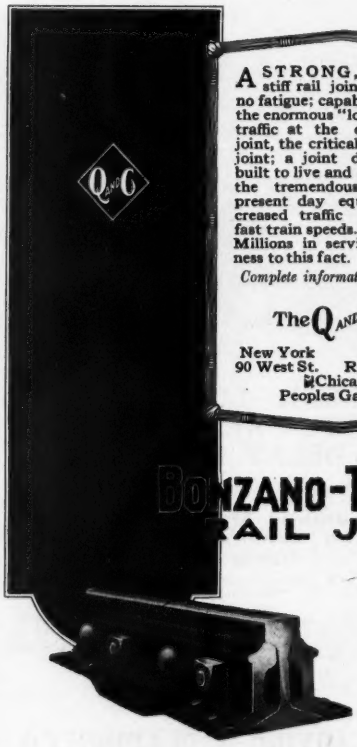
"MARIONS" WILL DIG BALLAST AS FAST AS IT CAN BE USED

and you can absolutely depend on their being ready when you are. Great capacity—steady, uniform operation—remarkable freedom from breakdown or need of repairs—these are *bona fide* distinguishing features of Marion Shovels, Ditchers, Dredges, Draglines, and Ballast Unloaders. Shall we send particulars? No obligation in requesting them.

The Marion Steam Shovel Company, Marion, Ohio

Branches: Atlanta, Chicago, New York, Philadelphia, San Francisco, Seattle

227 ESTABLISHED 1884



A STRONG, rugged and stiff rail joint that knows no fatigue; capable of resisting the enormous "load waves" of traffic at the center of the joint, the critical point of the joint; a joint designed and built to live and endure under the tremendous weight of present day equipment, increased traffic density and fast train speeds.
Millions in service bear witness to this fact.

Complete information on request

The Q AND C Co.

New York 90 West St.
St. Louis Ry. Exc. Bldg.
Chicago Peoples Gas Bldg.

BONZANO-THOMSON RAIL JOINT

"The Joint as Strong as the Rail"

This was a bad one

Now it is a good one

Because It Was Re-threaded With National Lock-Joint Cast-Iron Pipe

Look These Facts In The Face Before You Face Your Next Culvert Renewal Problem

How about your Culvert Renewal Expense for 1916?

Rather a good-sized item, was it not?

How about your Culvert Renewal Expense for 1917, 1918, etc., etc.? Looks as if that item in your annual maintenance budget was to be a source of annual regret, is that it?

Then hark! That heavy item is unnecessary, should be, **can be,** cut out; that is, reduced each year till it practically disappears. "Going! Going! Gone!" That's it exactly, "Now You See It and Now You Don't." Sounds like magic, but it is not. It is just sound engineering sense applied to culvert problems, and

National Lock-Joint Cast-Iron Pipe

installed for your culverts, that's all; but how it saves money in annual culvert renewals.

Right now, before you face your next culvert renewals, look these facts in the face.

National Lock-Joint Cast-Iron Pipe, made from remelted Alabama Pig Iron, is as permanent as your roadbed. It comes in short lengths (3, 4 and 5 ft.) that means easy handling. Those little old section gangs of yours will install it without accessory of any kind and without interfering with traffic. Re-thread the old culvert and back fill with cement—that's all; and, what is more, that's all you will hear from that culvert. See how the renewal expense vanishes, growing less each year.

And now, one last word. It is sold by the foot, first cost is low, before you know it you will have **no** Culvert Renewal Problem—"Going! Going! Gone!" The Renewal Expense, Not the Pipe. *Now you see it.*

CATALOGUE AND PRICES ON REQUEST

AMERICAN CASTING CO.
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New England Representative
Fred A. Haudlette & Son - Boston, Mass
St Louis Representative
H P Webb - - Wainwright Building
St Paul Office
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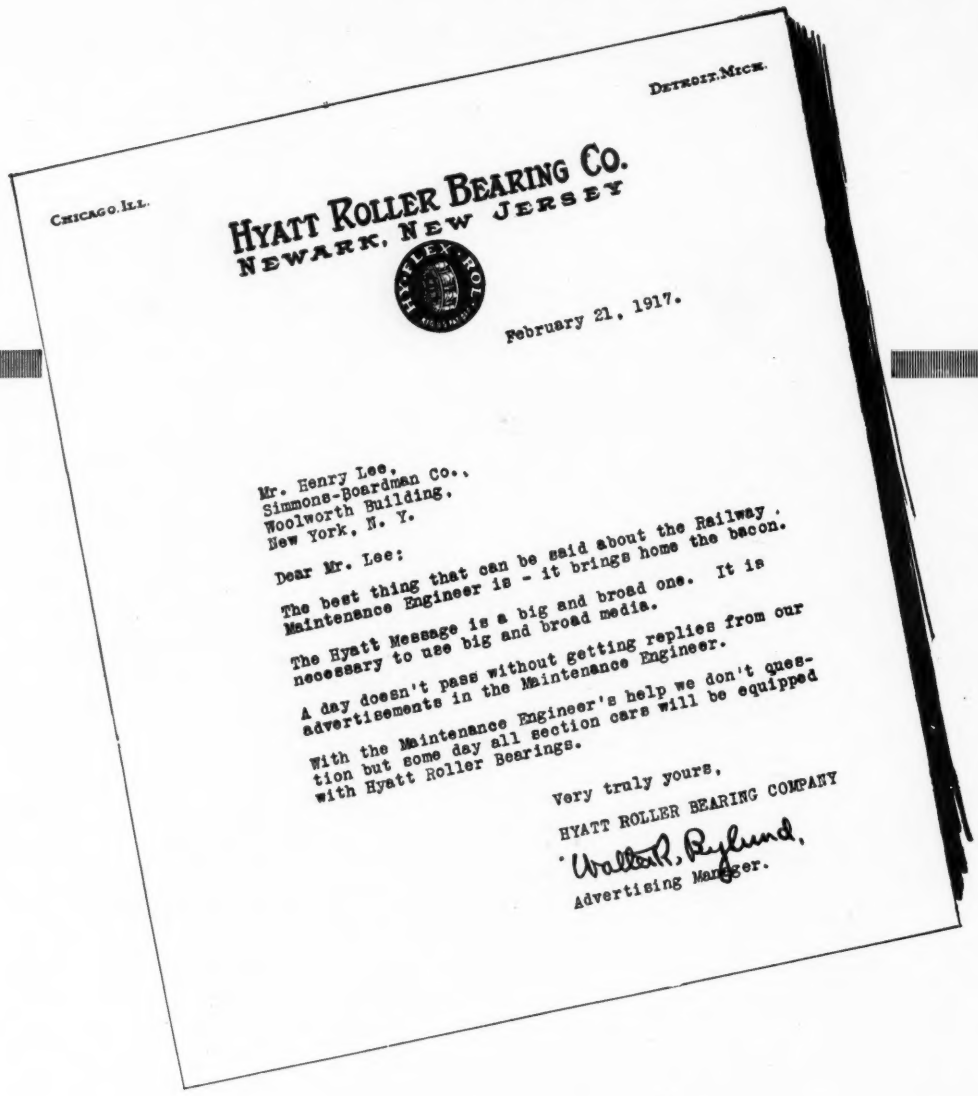

CHICAGO, ILL. DETROIT, MICH.

HYATT ROLLER BEARING CO.
NEWARK, NEW JERSEY

HY-FLEX-ROL

February 21, 1917.

Mr. Henry Lee,
Simmons-Boardman Co.,
Woolworth Building,
New York, N. Y.

Dear Mr. Lee:

The best thing that can be said about the Railway Maintenance Engineer is - it brings home the bacon.

The Hyatt Message is a big and broad one. It is necessary to use big and broad media.

A day doesn't pass without getting replies from our advertisements in the Maintenance Engineer.

With the Maintenance Engineer's help we don't question but some day all section cars will be equipped with Hyatt Roller Bearings.

Very truly yours,
HYATT ROLLER BEARING COMPANY
Walter P. Rylund,
Advertising Manager.

"The Railway Maintenance Engineer— It Brings Home The Bacon!"

The Railway Maintenance Engineer is a Member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.)